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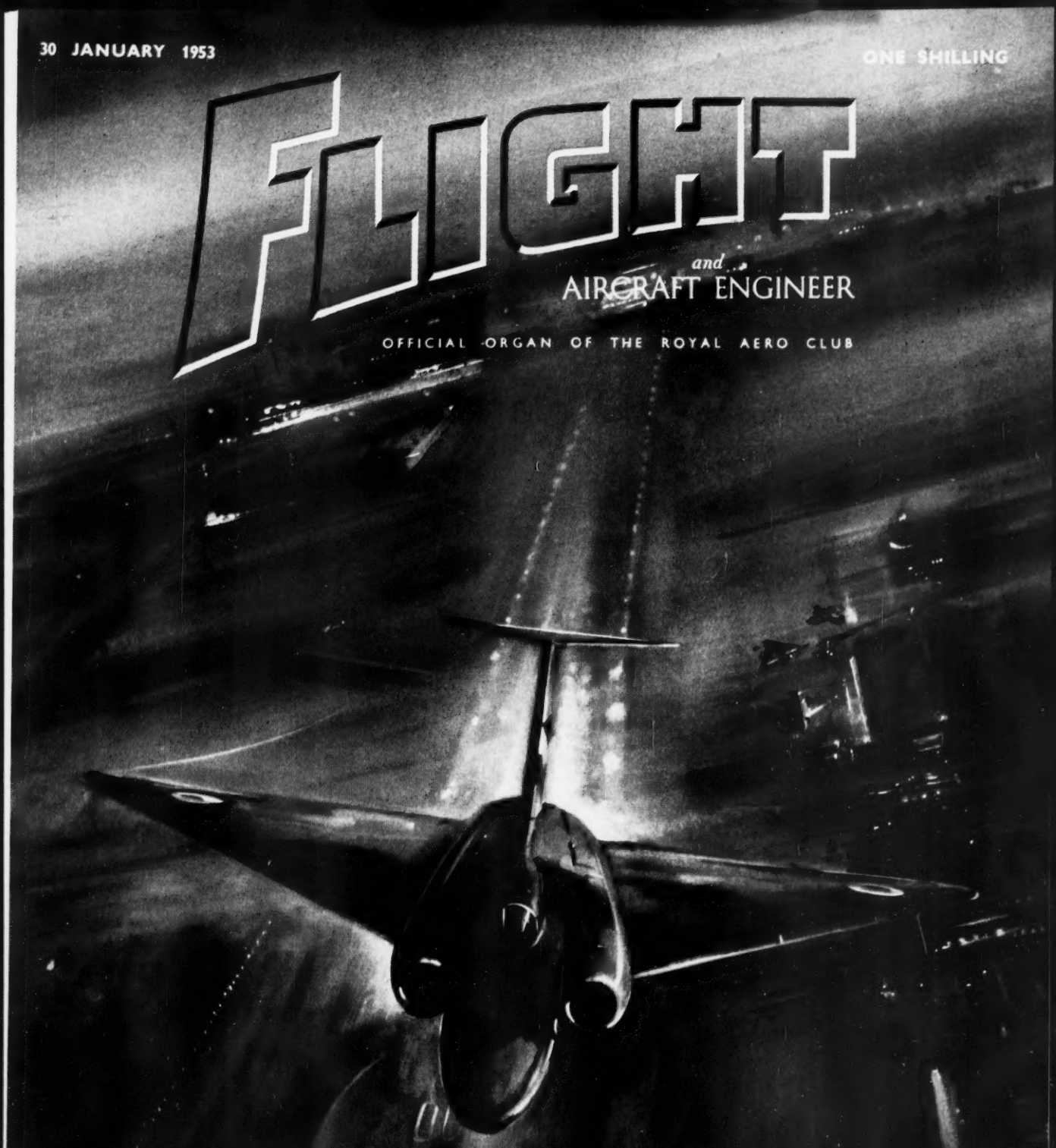

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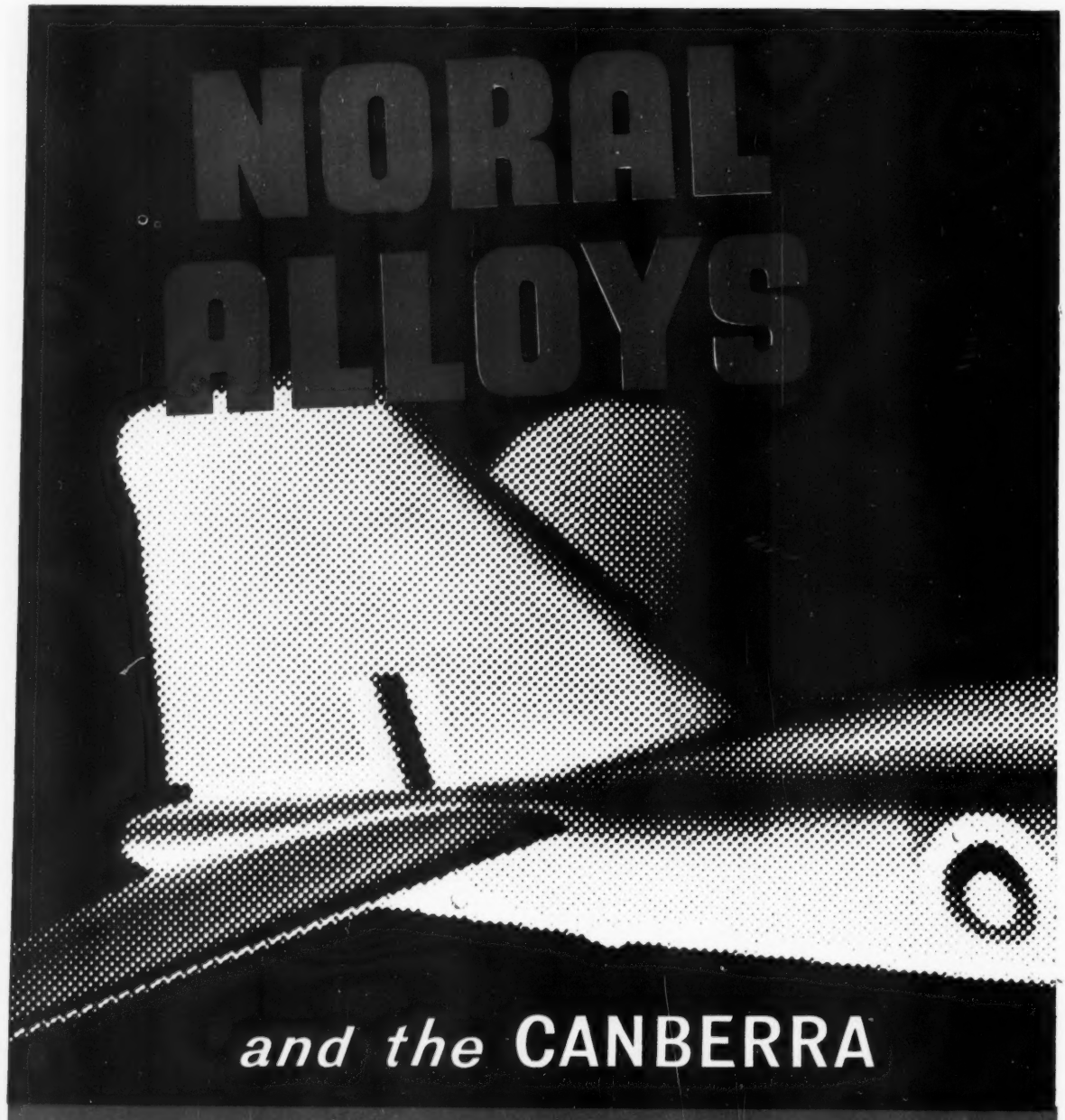

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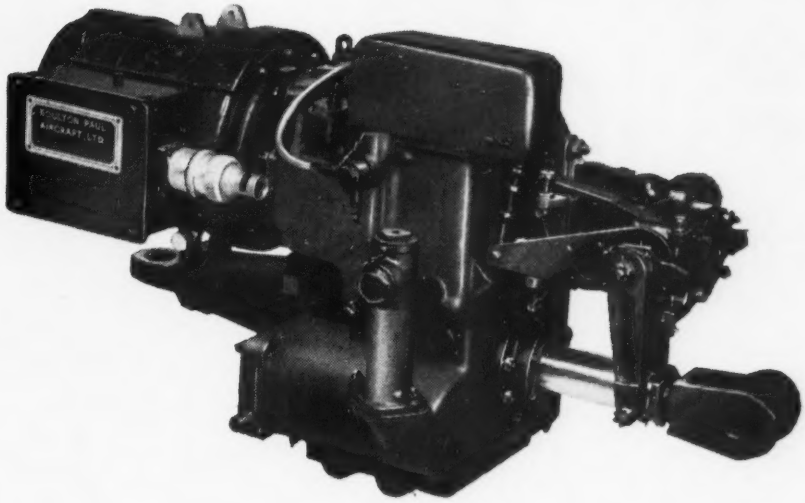

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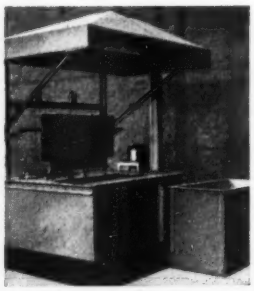

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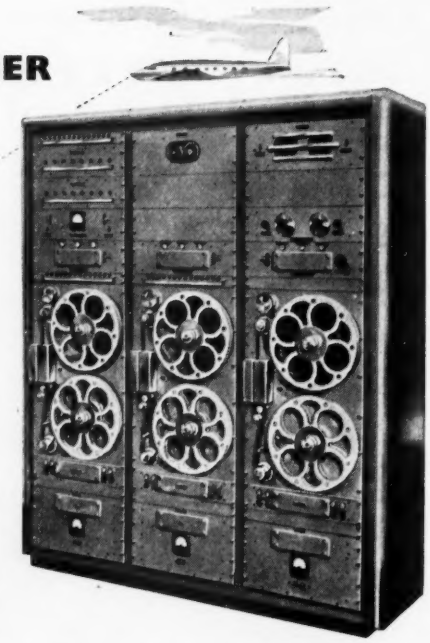

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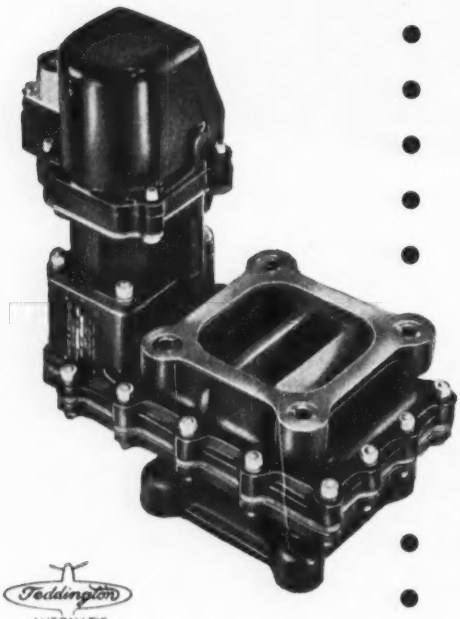

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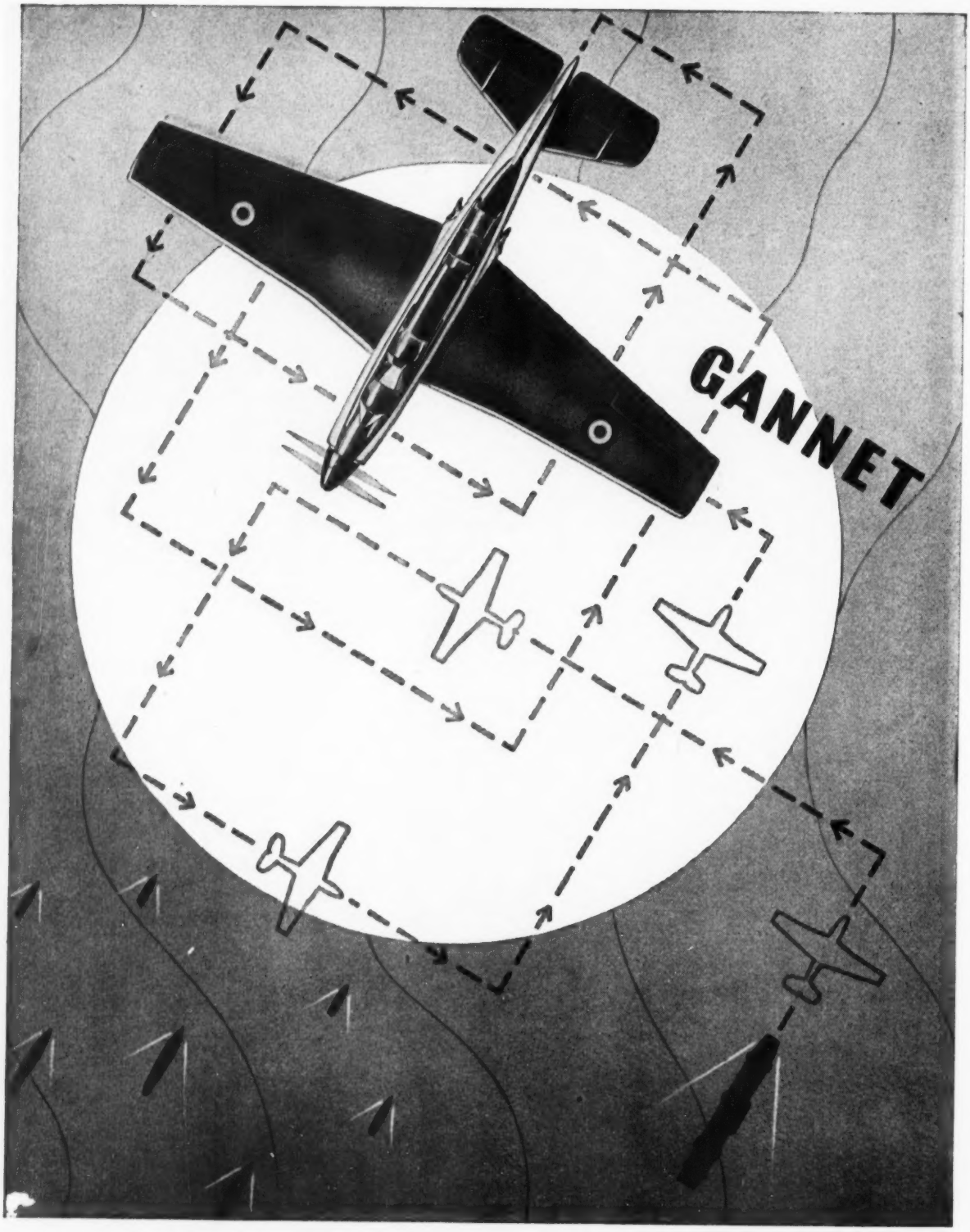

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IN THIS ISSUE:

Aircraft Intelligence - - 135
Sabre - - - - - - - 136
Sabre Cut-away Drawing 142
Wit and Wisdom at Boscombe Dinner 148
By Viscount to Wahn - 150

Divided They Stand . . .

REFERRING to reports that B.O.A.C. and B.E.A. might be combined, the chief executive of B.E.A. found it necessary, not long ago, to reassure his staff that there was "absolutely no truth in rumours of such an inefficient and costly move." Once more, however, a possible merger is reported to have been suggested in "influential quarters," producing further alarm and despondency—particularly among the staffs concerned. Employees of the two Corporations now display a keenness unmatched, we believe, in any other State undertaking, but a renewed uncertainty as to their future will inevitably discourage them.

This sort of instability is unfortunately still to be found in branches of British aviation. If a merger *is* to be effected, " 'twere better it were done quickly." But whether any real advantages would result is definitely open to doubt.

Most of the arguments advanced in favour do not hold water. It has been implied, for example, that, because Holland requires no purely internal air services, we in Britain could dispense with B.E.A. One might as easily quote the success of America's domestic airlines as proof that B.O.A.C. is unnecessary.

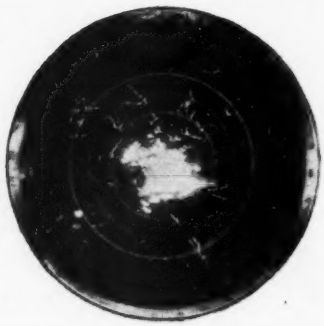
The sharp distinction between the operations of the two airlines proves that there is nothing artificial about the division of Britain's main air-transport activity into two spheres—overseas and European. Such a division would be just as essential if there were, in name at least, only one Corporation.

It is also suggested that a B.O.A.C.-B.E.A. merger would reduce the number of aircraft-types in service. Admittedly, the need for greater use of fewer designs is evident; B.O.A.C. are at present obliged to use six completely different types, and B.E.A.'s fleet is, for the time being, almost as diverse. Much of the Corporation's present equipment is to be replaced by modern machines better suited to their route-patterns, and for this very reason the Comet, Viscount and Britannia are in production or newly in service.

It would be tempting, but incorrect, to assume that the trend (at present apparent in Europe) to work medium-range routes with long-range aircraft means that medium-range airliners are no longer required. When a mainliner earns its keep on long-haul routes it can also profitably fill in time on convenient "local" routes; but it cannot bring cheap air transport to practically any point 200-1,000 miles from its base. For example, a machine such as the Viscount would be necessary to permit a return fare of only £6 between London and Scotland (assuming that no excessive tax is imposed on kerosine). The same aircraft could fly to Rome within 40 minutes of Comet time, carrying more passengers and burning less than half as much fuel. Despite the proved efficiency of such modern medium-range aircraft, nobody would seriously advocate their use on long-distance routes in preference to larger and faster machines specially designed for this purpose. The suggestion that all regional services be operated by long-haul aircraft as an incidental part of long-haul operations shows a serious lack of appreciation of both operating economics and traffic demand figures; for short-haul work, smaller units and higher frequencies are advisable, and the passenger demands for long and short distances are so different that a combination could only result in gross inefficiency.

An amalgamation of the two State airlines might well bring some administrative economies, but this is true of any sphere of industry in which activities are duplicated. The merger would probably mean a saving in senior-executive salaries (though not as great a saving as some might suppose) and reduction of expenditure in a number of departments. On the other hand, there would be a break in the continuity of management essential to commercial success. A vast, single monopoly—such as this merger might produce—is too liable to become over-centralized, unwieldy and unimaginative. It might never be possible to revive the team-spirit and competitive outlook which has been built up so painstakingly.

Over the past few years, reorganization of B.E.A. and B.O.A.C. has been essential. To demand further violent disruption shows lack of faith not only in the Corporations' staffs but in the future of British air transport as a whole. Costly lessons have been learned, and the airlines promise to pay their way. Now that we have produced aircraft which can link cities, countries and continents efficiently, and profitably, almost unlimited opportunities appear—opportunities which can best be exploited by the two State airlines together with the private operators.



ARTIFICIAL RADAR

Dual-purpose M.C.A. Equipment for Training Controllers

"FLIGHT" Photographs

WHILE Government officials are frequently attacked for extravagance, they rarely receive any credit for saving the taxpayer's money. Thus it seems only fair, in describing a new synthetic-radar device which will effect considerable savings in the training of air traffic control officers, to give full credit to its originators—namely Mr. J. Fenwick, A.M.I.E.E., and Mr. W. M. Maskell. Mr. Fenwick is signals officer in charge at the M.C.A. Air Traffic Control Experimental Unit, which is stationed at London Airport.

From a traffic-control viewpoint, Mr. Fenwick's trainer corresponds to the flight-simulator used to such good effect by the airlines in that it reproduces certain required aspects of aircraft behaviour without the need to use real aircraft. It produces on the screen of a surveillance radar realistic "blips" representing the flight-paths of a number of aircraft; all the data normally supplied by the transmitter and aerial are fed into the display screen of the radar console artificially. Reproduction is so faithful, however, that the trainer can be used to provide traffic-control students with experience virtually identical to that afforded by using complete radar equipment and genuine aircraft—at only a fraction of the cost.

Use of the new trainer will involve a complete re-organization of training methods at the Ministry's air-traffic-control school at Hurn. The previous practice has been to train A.T.C. officers either as traffic directors or talk-down controllers as required. The duration of the course was eight weeks, six officers being trained as traffic directors and two as talk-down controllers. The new policy will be to train all officers entering the radar field for the first time as traffic directors; they will attend talk-down control courses after gaining operation experience. The new course will last six weeks and the intake will be increased from eight students to 12—eight traffic directors and four talk-down controllers. The radar trainer will not only permit the number of aircraft hours flown per course to be reduced from 200 to 150 hours, but will allow traffic directors to spend many more hours at the console at no extra cost, and will give them experience of controlling up to three "aircraft" at the same time. Previously this was impossible, due to the prohibitive cost of putting three training aircraft into the air simultaneously. Incidentally, light single-engined aircraft are not suitable for this work.

As the complete trainer can be constructed for something like £8,000, it will obviously pay for itself before very long

The surveillance radar screen shows the range and bearing, but not the elevation, of an aircraft. At present, therefore, it is not possible to simulate the final stage of a ground-controlled approach. The A.T.C.E.U. is at present engaged in developing a synthetic precision-approach radar.

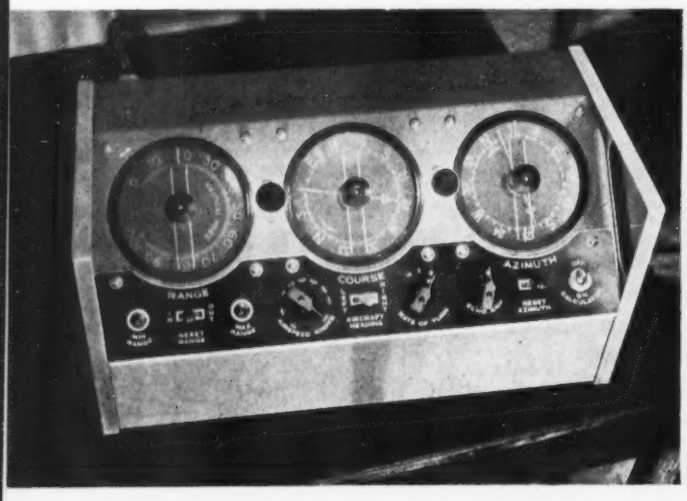
In addition to its advantages as a cheap method of training radar operators, the trainer also promises economies in another role—as a "test bed" for new control-zone and approach procedures. The ability to vary the speed and manœuvrability of the synthetic aircraft makes it possible to apply such procedures to the actual performance of machines such as the Stratocruiser or Comet without spending anything up to £500 per hour for the loan of the airliner.

In its initial form, the radar simulator will reproduce the movements of six synthetic aircraft, but it is planned to increase this number to 20. It is, of course, recognized that it will not altogether dispense with the need for "live" tests of new radar procedures; it will, however, involve only a fraction of the cost, making possible constant repetition of procedures and the simulation of traffic problems which could not be tried out with live aircraft.

Several synthetic radar devices were produced for training purposes during the war, and these were reviewed by the M.C.A. experimental staff before embarking on design work. They found, however, that none of the existing designs was suitable for their purpose and Mr. Fenwick built a "mock-up" trainer from spare parts (at a total cost of 9s) to prove his original theory. The finished trainer, as demonstrated recently at London Airport before being transferred to Hurn, embodies equipment—housed in four enclosed racks—capable of producing reflections representing four aircraft. Position and range of the synthetic aircraft are electro-mechanically calculated and the angular positions of shafts representing range and bearing are used to produce a short pulse appearing in the correct position on the screen of a M.E.W. (microwave early-warning) surveillance radar. All the data normally obtained with radar of this type are produced artificially—aerial-turning information, timing-base trigger, range markers and permanent echoes (natural reflections caused by obstructions in the neighbourhood of the transmitter). The heading, rate of turn, air speed and initial position of all four aircraft can be altered independently by the "pilot" operating the remote control panel.

The capacity of the trainer to simulate the behaviour of

This control-panel (left) is one of four supplied with the new M.C.A. radar trainer; it enables an instructor to determine the precise behaviour of an "aircraft" on the surveillance-radar screen. The originators of the device are (right) J. Fenwick (seated) and W. M. Maskell; on their right are glimpsed racks containing equipment for feeding artificial echoes into the radar display (a new type of 12in screen developed by the A.T.C.E.U.).



both the aircraft and the surveillance radar can be measured by the following data:—*Aircraft:* bearing through 360 deg and range of 2 to 90 miles from transmitter; wind-speed, up to 50 kt over 360 deg; airspeed, 150-450 kt; heading through 360 deg; rates of turn of ½, 1 or 2. *Radar:* amplitude of radar response; pulse-width, 1-5 microseconds; aerial beam-widths, 1-5 deg at half-power points; speed of rotation, 0-30 r.p.m.

The trainer has attracted considerable interest abroad, particularly in the Commonwealth countries, and arrangements for its commercial production have been announced by Marconi's Wireless and Telegraph Co., Ltd. The first models will be available for delivery by the end of the year. Marconi have also drawn attention to the military potentialities of the device, stating that "as this trainer is capable of being integrated into any existing radar system, it is possible for service training purposes to use real planes as 'tactical targets' and introduce the simulated echoes as intercepters."

International Aeradio, Ltd., was also quick to realize the value of the trainer and has been in close touch with the M.C.A. during its development. While quantity production will be undertaken by Marconi, I.A.L. is itself building two examples—one for early delivery to a Commonwealth government and one demonstration model as a complement to the well-known I.A.L. air-traffic-control synthetic trainer.

The real thing: a surveillance P.P.I. at London Radar. The screen is giving coverage within a 30-mile radius from London Airport; permanent echoes are responsible for the bright patches in the centre, and the dotted lines show aircraft-movements during the time-exposure. The new synthetic equipment produces a virtually identical effect.

THE GROUNDED STRATOCRUISERS

IT is singularly unfortunate that British Overseas Airways Corporation, which had hoped to show an operating profit for the second year running on March 31st next, should have experienced so severe a winter—from several aspects. The English weather has rarely been so bad from the airline viewpoint and delays and cancellations are estimated to have cost the corporation nearly £100,000. Then a Comet hit an African workman at the head of the runway at Entebbe and, as we go to press, is still out of service. Finally, the greatest set-back occurred when, on the night of Thursday, January 22nd, the Corporation's entire fleet of ten Boeing 377 Stratocruisers was grounded following an unprecedented series of engine faults.

On this day, the Prime Minister, Mr. Winston Churchill, was to have flown in a B.O.A.C. Stratocruiser from Montego Bay, Jamaica, to New York, on his journey home. Eventually, a Constellation was found for him, ten hours late. Other Stratocruiser passengers were accommodated on tourist Constellations, or found space in foreign aircraft. The loss in revenue to B.O.A.C. is placed at £10,000 to £20,000 per day, according to the number of Stratocruiser services scheduled. With commendable speed, Constellations were diverted to transatlantic services to take as much of the load as possible.

The aircraft concerned were built in 1949 and had established an enviable record on B.O.A.C.'s No. 1 line. Over 3,350 Atlantic crossings had been made without incident and the Corporation had a better record of serviceability with its Boeings than any other operator—including PanAm, Northwest Airlines, and the MATS who operate nearly 300 Boeing transports. The symptoms were those of engine overheating and seizure—partial or total—and occurred at all conditions of r.p.m. and power, although the majority of the incidents were experienced during pre-flight run-ups. In all, fifteen cases occurred within six days, and at widely separated points on the Stratocruiser route. There was no indication that the trouble occurred after any set number of hours—some of the engines were quite new—and no other operator was affected.

Six of the aircraft were held at London Airport and the other four were grounded at four places—Filton, Bristol; New York; Nassau, Bahamas; and Montego Bay, Jamaica. At once, the complete Pratt and Whitney Wasp Major power-plants were removed and a thorough programme of stripping and inspection was initiated. At the main B.O.A.C. overhaul base at Treforest, near Cardiff, voluntary double-shift working was undertaken for a number of days following the grounding, and Pratt and Whitney sent over a number of technicians from the U.S.A. An obvious place to look for trouble was the lubrication system, and the oil was drained from the aircraft at London and analyzed both by Shell and by an independent body, but with negative results. One of the Stratocruisers had put down at Montreal in the first instance, and this aircraft went on to New York—with faulty oil pressure, it is reported—so that the offending engine could be examined by Pratt and Whitney at first hand.

Finally, last Monday, Mr. Richard Treat, resident Pratt and Whitney engineer at London Airport, announced that the trouble had been located in the Wasp Major's crankshaft bearings—presumably the main bearings, which are normally items giving very little trouble. The four-row Wasp Major has five such bearings—plain silver-lead units—for the one-piece crankshaft. It was stated that "the cause of the failures was unsatisfactory lubrication of the engine bearings, due to excessive dilution of the lubricant with petrol and air under certain conditions . . ."

Oil-dilution is, of course, quite a common practice in aircraft operation. The petrol, added to the oil to reduce viscosity for cold-weather starting, normally evaporates rapidly once the engine starts firing; in the case of the Stratocruisers, apparently, the petrol remained in the bearings for some unexplained reason and the resulting diluted oil-film broke down and caused seizure. With minor modifications it is hoped to make all the B.O.A.C. Stratocruisers airworthy and prevent a repetition of the trouble.

MASTER PILOT CERTIFICATES

THE Guild of Air Pilots and Air Navigators of the British Empire has announced the introduction of Master Air Pilot certificates for professional pilots of the Commonwealth, in recognition of the highest standards of skill, experience, reliability and service to aviation. The certificate will be awarded to transport pilots, test pilots and flying instructors (on differing requirement criteria), on the recommendation of a committee, by the Court of the Guild.

Typical minimum requirements (to which there are additions and alternatives) are (a) 12 years' licensed experience as an airline pilot; 7,500 hr in command; 10 years with Airline Transport Pilot's Licence. (b) Eight years' experience as a test pilot; 3,000 test flights; and the equivalent of the Guild's standards for a Grade 1 test pilot. (c) 3,000 hr instructional experience; a valid professional licence; instrument rating; instructor's certificate; two years' administrative experience in connection with flying training.

Application forms and further details concerning eligibility can be obtained on request to the Guild, and all details of qualifications will be treated confidentially. It may be recalled that a Master Pilot Certificate was introduced before the last war by the Air Ministry, and a Master Instructor's Certificate, on similar lines, by the Guild.

FROM ALL QUARTERS

Foreign-fuel Restriction Eased

IN a leading article and a news item on January 16th we criticized the new currency regulation—potentially dangerous in its effects—which would limit British air tourists to an annual expenditure of £15 for fuel and oil purchased abroad.

A few days later—in the House of Commons on January 20th—the Chancellor of the Exchequer, Mr. R. A. Butler, gave the welcome news that it has now been decided to increase the allowance to £50.

Mr. Butler had been asked by Mr. Charles Ian Orr-Ewing (Con., Hendon North) to state the annual cost in foreign exchange of supplying petrol carnets for private flyers, and to explain why he had cancelled the facility, in view of the serious repercussions which the cancellation would have on the number of private aircraft and reserve pilots available in an emergency.

Mr. Butler replied that no accurate information was available. The facility referred to had not been cancelled. Arrangements were made to ensure that applications could be seen by the Exchange Control Authorities so that the rate of expenditure could, if necessary, be controlled.

He then added that, as a result of inquiries, he had decided to allow petrol and oil to the annual value of £50 to be supplied abroad to private flyers. Special facilities would be available for flights for business purposes.

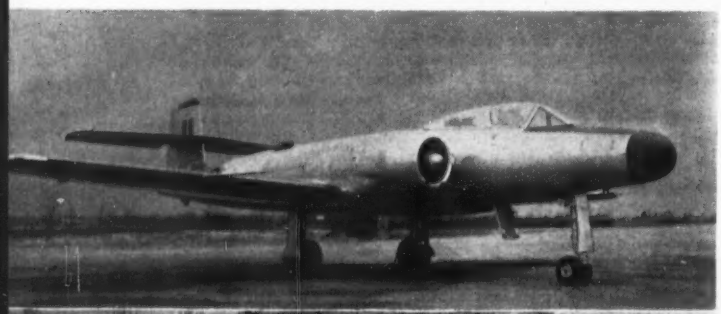
A very real threat to the future of air touring is thus removed. As we pointed out at the time, one serious result of the restriction would have been the introduction of an element of danger by reason of the fact that the private owner would naturally tend to keep his foreign fuel-uplift to a minimum, despite—in many cases—a lack of radio aids that would make a good fuel-margin all the more desirable.

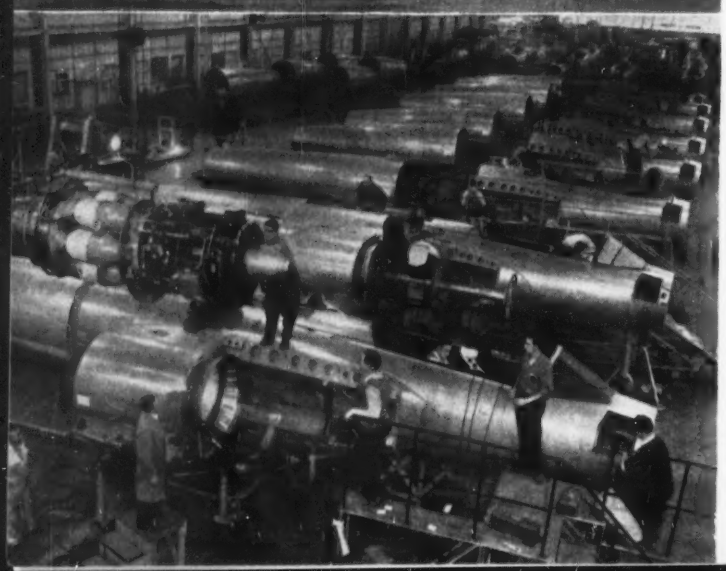
Big U.S.A.F. Contract for British Firm

AN important contract, stated to be worth over two million dollars, has been awarded by the U.S.A.F. to a British firm of specialists in aircraft overhaul—Field Aircraft Services, Ltd., of Croydon, one of the companies of the Hunting Group.

The contract is for the overhaul of C-47 Dakotas used in European operations, and it is the first of its kind to be placed in Britain by the U.S.A.F. Overhaul of the complete aircraft is to be carried out by Fields, airframes, engines and instruments being serviced at Tollerton, Croydon and Bovingdon respectively.

The fact that such a useful dollar contract has been placed in Britain, in spite of competing tenders from France, Belgium, Holland, Scandinavia and Italy, is most creditable to Fields.





Jet Fighter Exports to Middle East

IN the House of Lords on January 20th, Lord Strabolgi put questions concerning the supply of "modern jet-engined military aircraft" to the countries in the Middle East. He asked what the policy was, how many such aeroplanes had been supplied during the last six months, and to which countries, and how many it was agreed to supply in the near future, and to which countries.

The Marquess of Reading (Joint Parliamentary Under-Secretary for Foreign Affairs) replied that, as the result of the changes in the defence programme announced by the Prime Minister last July, it had become possible to resume the jet-aircraft export which had been suspended after the outbreak of war in Korea, and thus to meet the requests of foreign governments—including those of the Middle East—some of whom placed orders and made payments on account as long ago as 1950.

H.M. Government had, of course, to satisfy themselves that there were no strong political objections. Their policy in such matters was based on a joint statement by the Governments of the United Kingdom, United States, and France on May 25th, 1950. This recognized the need of the Arab States and Israel to maintain a certain level of armed forces for internal security and legitimate self-defence and for the purpose of enabling them to play their part in defence of the area as a whole.

The aircraft in question were jet fighters and, as such, essentially a defensive weapon, and the Government did not consider their action in authorizing the supply of these aircraft was in any way inconsistent with their responsibilities under the joint statement.

The undertaking given in that statement to prevent violation of frontiers or armistice lines remained in full force and effect.

It was not the practice of the Government to disclose publicly all details of defence equipment supplied to foreign governments, but an assurance could be given that the number of aircraft already exported, and authorized for export in the near future, was small.

Lord Strabolgi asked if Egypt was not one of the states receiving the aircraft. Was it not true that our own forces in Egypt were in threat of violence at the present time? What was the sense of supplying modern aircraft to Egypt?

Lord Reading replied that that raised a considerable question not easily answered by supplementary question and answer. Certainly Egypt was one of the countries involved.

The Flying Schools: Commons Protests

MEMBERS on both sides of the House of Commons joined forces on January 21st to protest against the Government decision to close down certain civilian and R.A.F.V.R. flying schools.

When a spirited exchange of questions with Mr. George Ward, Under-Secretary for Air, had established that there was no disposition on the Government's part to modify the decision, a Conservative Member gave notice that he would raise the matter on an adjournment motion.

The account which follows would be incomplete if it did not mention that Mr. Ward's demeanour at the dispatch-box was markedly uneasy.

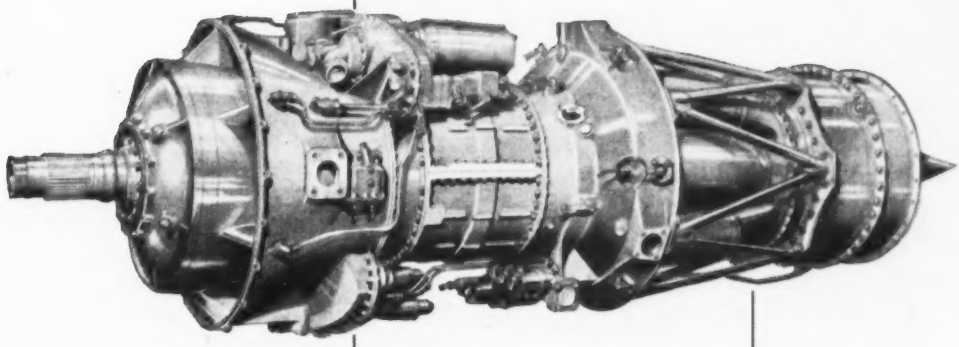
A. Cdre. A. V. Harvey (Con., Macclesfield) and Mr. W. R. D. Perkins (Con., Stroud and Thornbury) asked what alternative employment was contemplated for the instructors concerned, and what compensation would be paid to those who were being displaced without being offered alternative employment.

Mr. Ward replied that about 150 inquiries had so far been received for re-entry into the R.A.F. following publication of a wide variety of engagements—ranging from four to eight years' regular service—and interviewing would start on January 26th. Contracts with the civil firms in no case exceeded three years and contained a break clause which provided that they could be terminated at three months' notice; in these circumstances the Air Council could not admit any claim to compensation by employees.

A. Cdre. Harvey complained that many of the instructors were aged between 40 and 50 years and had given something like 20 years to the country. Was not the Air Ministry getting out of this matter in a very shabby manner? Mr. Ward rejected the word "shabby" and said everything possible had been done to help those who wanted to come back to the Air Force; many of those who did not would find employment as pilots with civil airlines.

Mr. Perkins asked whether or not Mr. Ward had received an

PROTOTYPE AND PRODUCTION: A recent visitor to London was Mr. Ron Williams, immediate assistant to Mr. Crawford Gordon, Jnr., president of A. V. Roe (Canada), Ltd. From Mr. Williams' briefcase come these views of (above) the rocket-armed CF-100 Mk 4 prototype, lately demonstrated as supersonic by ex-Gloster test pilot Jan Zurakowski, and of CF-100 Mk 3 production for the Royal Canadian Air Force. An Avro Canada Orenda turbojet is seen in process of installation.



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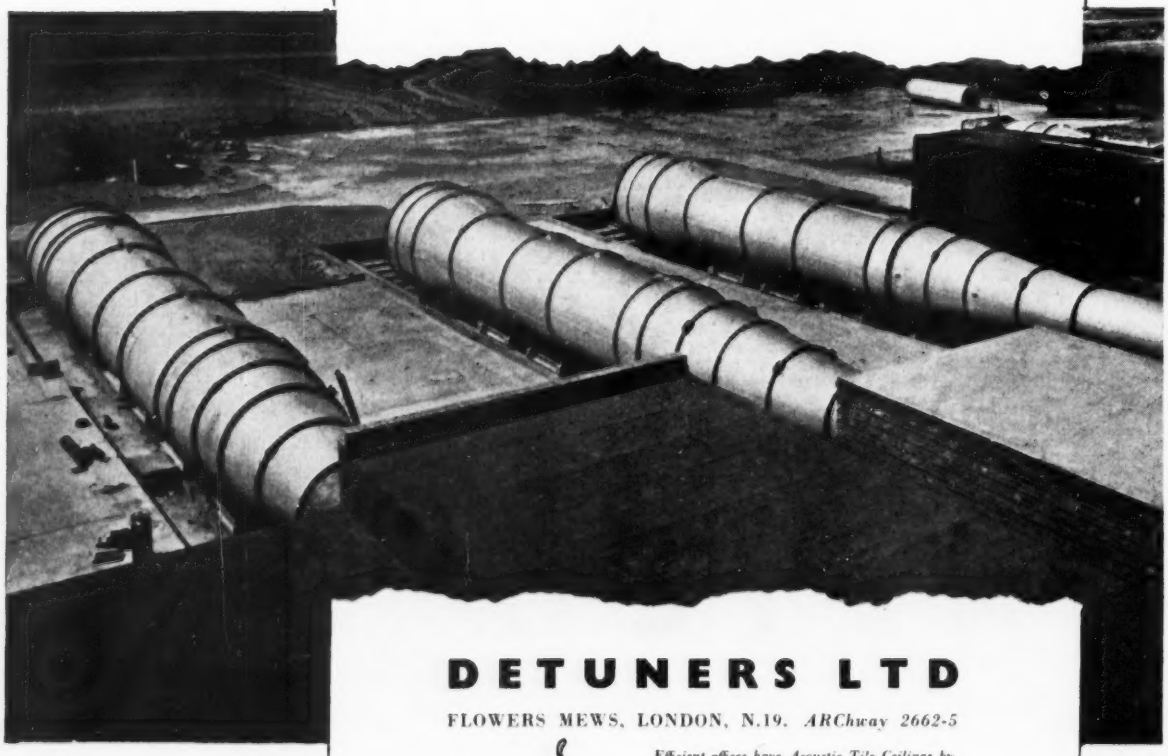

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FROM ALL QUARTERS . . .

application from B.A.L.P.A. for an interview over a month earlier, and whether that interview had yet taken place. Mr. Ward replied he had received and fully answered the letter; all the arguments advanced had been dealt with.

Mr. Frank Beswick (Lab., Uxbridge) mentioned the three-year contract, and asked if it was not a fact that in the case of Kirton Lindsey the school had only opened in 1952, and that it was closed "almost casually" just before Christmas.

Mr. Arthur Henderson (Lab., Rowley Regis and Tipton) submitted that if the parties concerned had been approached in 1951 and told "We will be closing you down in 1952" it was doubtful whether one of them would have agreed to open a school. Mr. Ward said that at the time the schools were opened it was the policy to have a certain number of National Servicemen trained under civil contract, but that policy was changed when the National Service intake was reduced. The terms of the contracts were well known.

Mr. Perkins—who sounded most annoyed indeed—gave notice of his intention to raise the matter on the adjournment. (His ability to do so would depend upon luck in the ballot.)

A. Cdre. Harvey then asked for further details of the cuts, and for an outline of future policy. Mr. Ward regretted that he could not add to the previous statement, but said he hoped to deal fully with the matter in introducing the Air Estimates. He gave a similar reply, stressing "very many factors which entered into the decision and change of policy" when A. Cdre. Harvey commented that in the meantime the flying instructors and ground staffs at other flying training schools were very concerned. An early statement was desirable if it was intended to close down, and there was the further point as to what was to happen to the surplus aircraft of the schools already under notice.

Mr. Geoffrey de Freitas (Lab., Lincoln) spoke of many older instructors who were led to believe they had several years of steady employment in front of them. Mr. Ward: "Who led them to believe that? Not the Air Ministry."

Mr. Beswick suggested the schools could be used for the training of Regular and N.S. pilots, so enabling economies to be effected in uniformed manpower in Flying Training Command, but Mr. Ward dissented, saying the Service flying training organization had been developed for the express purpose of training Regular pilots, and would continue to be so used. With smaller N.S. intakes, it was now possible to absorb N.S. pilots into Flying Training Command so that separate civilian schools were no longer justified.

When Mr. Beswick pressed the point, Mr. Ward recalled his recent announcement on the Provost-Vampire training sequence, which could not take place at civilian-operated schools. Moreover, there was advantage in a pupil absorbing the Service atmosphere during his training.

He found it impossible to state how many of the civilian flying instructors, numbering approximately 300, and licensed engineers, would lose their employment. Some would undoubtedly be transferred to other employment under the same firm.

On a different tack, Mr. Beswick asked what facilities would now be available for N.S. aircrew who had completed their flying training to maintain flying practice. Mr. Ward replied that such pilots would have been trained to fly modern jet aircraft, and it was hoped many of them would join the R.Aux.A.F. Facilities for flying piston-engined types would for the present continue at the 14 Reserve schools not affected by the recent decision.

Mr. Beswick then asked if it would be possible to have training in the evenings and at the week-ends, as was possible with a number of civilian schools spread over the country.

Mr. Ward here advocated a sense of proportion. It would be very pleasant for everybody to go on flying at the public expense; but what was wanted was to make the greatest possible use of the pilots who were going to stay in longer to become operational pilots, or Auxiliaries who were going to be of most use on the outbreak of any war, because they would have kept themselves refreshed in operational flying.

Mr. Ward informed Mr. Charles Ian Orr-Ewing (Con., Hendon North) that four applications had been received from N.S. pilots under the pre-selection scheme for commercial aviation. Eighteen had been appointed on direct application to civil companies.

Australia in a Day

AT 083544 hours last Tuesday, January 27th, F/L. Dick Whittington and his navigator-observer, F/L. J. A. Brown, took off from London Airport in an English Electric Canberra P.R.3 (two Rolls-Royce Avons) on a delivery flight to Australia. The ultimate destination of the aircraft is Woomera, and the flight was officially timed with the intention of setting up a new record of under 24 hours to Australia. The present best time, set up in 1946 by the R.A.F.'s Lancaster Aries I, is 45 hours 35 minutes.

The Canberra was due to make landings at Fayid, Egypt (E.T.A. approx. 12.45); Mauripur, Karachi; according to weather, at Butterworth or Singapore after the Indian Ocean crossing; and then to Darwin. The distance is just over 8,600 miles. The four legs were expected to take just under six hours each, and turn-round periods on the ground of one hour were planned. Much of the preparation for the flight has been the work of G/C. G. A. V. Clayton, superintendent of flying at Boscombe Down, and of the crew of two. A. Cdre. Wheeler, Commandant at Boscombe, was present at the take-off.

A Comet on the B.O.A.C. Far East service was to help with high-altitude *en route* weather reports, and London Airport's take-off forecast was fair to good weather all the way, with tail-winds as expected. As we closed for press the progress reported was : Arrival at Fayid, 1305; take-off for Mauripur, 1358.

THE M.7 FLYING BOAT with its designer and test-pilot (James Donald) and, behind, "Doctor" Noel Willman. (See "Saro Beware," below.)

Saro Beware!

LAST night, January 29th, the premiere of a new British film with a strong aviation interest was due to take place at the Odeon, Leicester Square. Its title, *The Net*, alludes to the security restrictions which enmesh the characters concerned with the M.7, a delta-wing flying-boat project said to be capable, when its "nuclear units" are brought into action, of flying at Mach 3.

The imagination of the film maker wishing to depict a futuristic aircraft can easily run riot, often with ludicrous results, but those responsible for *The Net* have avoided the major pitfalls. The M.7, "designed" by G/C. Peter Wykeham-Barnes, D.S.O., O.B.E., D.F.C., A.F.C., is a quite exciting and—apart from one or two details—credible aeroplane. Science-fiction pressure-suits, of Michelin-man appearance and including goldfish-bowl helmets, also play prominent parts. Appropriately, perhaps, they were designed by Frankenstein and Sons (Manchester), Ltd.

The name of Stanley Grant appears among the credits : he is responsible for the aerial photography, which is both beautiful and convincing. Anthony Asquith was the director.

Those 'Offshore' Hunters

THE latest development in regard to a possible offshore-purchase order for Hawker Hunters—discussed in these columns a fortnight ago—is that a group of U.S. procurement officers is now in this country with direct authority to negotiate a contract. It is said that 200 aircraft, plus the necessary spares may be ordered, at a cost of approximately $70m, but the difficulty still arises of the June, 1955, Congressional deadline—the date by which all offshore products must, under present policy, be delivered. The R.A.F. requires, and is scheduled to obtain, all Hunter output between now and that date, and some means will have to be found of overcoming this apparent impasse if an offshore contract is to be placed. One possible solution is that the aircraft should be purchased with Mutual Security Agency dollars and then allocated to the R.A.F., later production going to other NATO countries.

Other views that have been expressed recently are that the Hunter could be manufactured under licence in Holland, and the Avon in Belgium, and that a contract for Swifts may yet be forthcoming when certain modifications have been incorporated.

About Titanium

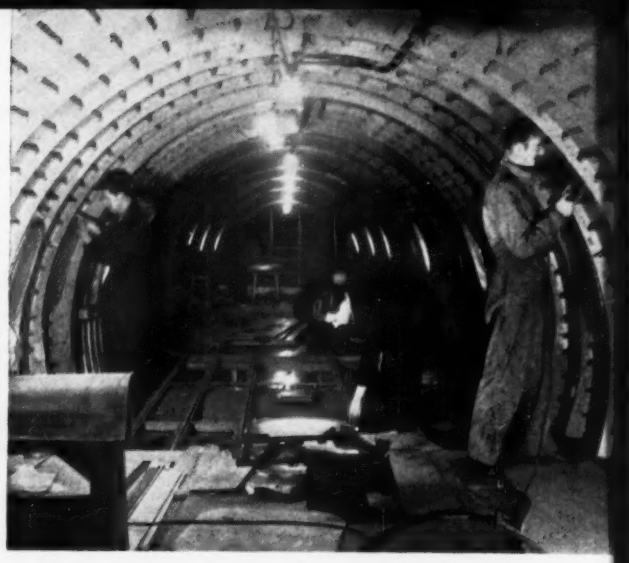
YESTERDAY, January 29th, Maj. P. L. Teed, A.R.S.M., M.I.M.M., F.R.Ae.S., was due to deliver a Royal Aeronautical Society lecture under the title *Titanium—a Survey*.

Maj. Teed—who is Vickers-Armstrongs' deputy chief of aeronautical research and development—naturally made no attempt at a precise evaluation of the "new" material which formed his subject, but contented himself with surmises based on analogy with the development of other engineering metals.

After reviewing the so-far brief history of titanium and methods of extracting it, the lecturer went on to examine its properties. He said that the present physical mechanical and fabrication characteristics of commercially pure titanium were such that, neglecting price considerations, the aeronautical engineer could not fail to be interested; for some applications it was definitely superior to austenitic steels. A considerable number of known titanium alloys offered (at least at temperatures of up to 350 deg C) some specific properties superior to those of ferritic alloy steels.

Turning to the debit side, Maj. Teed quoted some less attractive features of titanium—low specific Young's modulus, physical instability at slightly elevated temperatures, poor rubbing properties, disposition to chemical activity about 500 deg C, and difficulties in forging, heat treating, machining and fabrication. On past experience, these drawbacks were likely to be mitigated in varying degrees; but the most difficult problem was likely to be the improvement of the elastic moduli by an amount sufficient to attract the designer of supersonic aircraft.

HERE AND THERE



ON THE LINE: Work progresses rapidly inside the fuselage of the second Britannia prototype, under construction in the Brabazon assembly hangar at Filton. This view shows well the extremely spacious interior, and the close-pitching of light-section frames and stringers.

I.Ae.S. Honour for Peter Masefield

RECENTLY we reported the award of an Honorary Foreign Fellowship of the Institute of the Aeronautical Sciences to Mr. C. C. Walker of de Havillands, and of a Fellowship to Mr. G. H. Dowty. Now comes news that Mr. Peter Masefield, B.E.A.'s chief executive, is also honoured with a Fellowship. The honours were due to be conferred at the I.Ae.S. dinner in New York last Monday.

Holland's Air Strength

IN an annual survey, Lt.-Gen. I. A. Aller, Chief of the Netherlands Air Staff, said that during 1952 the Dutch Air Force had more than doubled in strength, and had fulfilled all its international commitments. None the less, new day and all-weather fighters were urgently required, and training needed stepping up by some 50 per cent, since total operational strength was still only half of that planned.

Korean Engagements

ON Wednesday of last week a large force of Mig-15s appeared over "Mig Alley", and a series of fights with U.S.A.F. Sabres ensued. By the end of the engagement, seven enemy aircraft were claimed to have been destroyed and three others damaged. No mention has been made of American losses. According to Peking Radio, an American Superfortress was shot down on the night of January 12th over Wu Lung Pei, ten miles north-west of Antung, the Mig-15 base near the Yalu river in Manchuria. Three of the crew are stated to have been killed, and the remaining eleven, including Col. J. K. Arnold, Jun., commander of 581 Air Supply Communications Wing of the 13th U.S.A.F., taken prisoner. The Chinese claim that the aircraft was engaged on a "special strategic reconnaissance mission at the time."

Still Swarming

THE first two 600 h.p. R-1340 Wasps built by the new Canadian Pratt and Whitney factory at Jacques Cartier have come from the production-line, three months ahead of schedule. One engine is now undergoing calibration by the National Research Council and the other a 150-hour qualification test. The first batch of engines will power the perennial Harvard, still in production for the R.C.A.F.; others will go to the U.S.A. and various NATO powers. It is worthy of remark that the original (400 h.p.) Wasp went into production 27 years ago.

Aviation Films in Birmingham

THE Birmingham and District Aviation Club is to hold a film show, open (free) to the general public, at Birmingham International Centre, Suffolk Street, at 7 p.m. on February 17th.

French Fighter Production

PRODUCTION of Mystère II and IV fighters will begin this year, and "other promising types of aircraft" are nearing the production stage, according to M. Pierre Montel, the French Secretary of State for Air. He said at a recent conference that present deliveries of military aircraft were 500 a year, and that this could be doubled if sufficient funds were available—but the Air Force budget was expected to be only about 292,000 million francs (£288 million), and this was merely sufficient to keep the Service at its present level whilst improving its quality. Every endeavour was still being made to reduce the number of engine types required, M. Montel added.

ROBERT BLACKBURN, O.B.E., F.R.Ae.S., is the subject of this portrait by Bernard Adams, R.O.I.; on Wednesday last the painting was due to be presented by Blackburn and General Aircraft, Ltd., to the Royal Aero Club, where it will be hung with the Club's other portraits of the pioneers. In the background is the Blackburn monoplane of 1909, on Filey Sands, where it first flew.

Cowes Airport for A.S.T.

THE lease of Cowes Airport, Isle of Wight, has been acquired by Air Service Training, Ltd., who intend to use the airfield for training their pupils in forced landings. At the moment they are using a field at Soberton, in south-east Hampshire, for such practice. It is understood that A.S.T. may later apply for a licence to employ Cowes as a relief airfield for their main base at Hamble.

A.F.E.E. Addendum

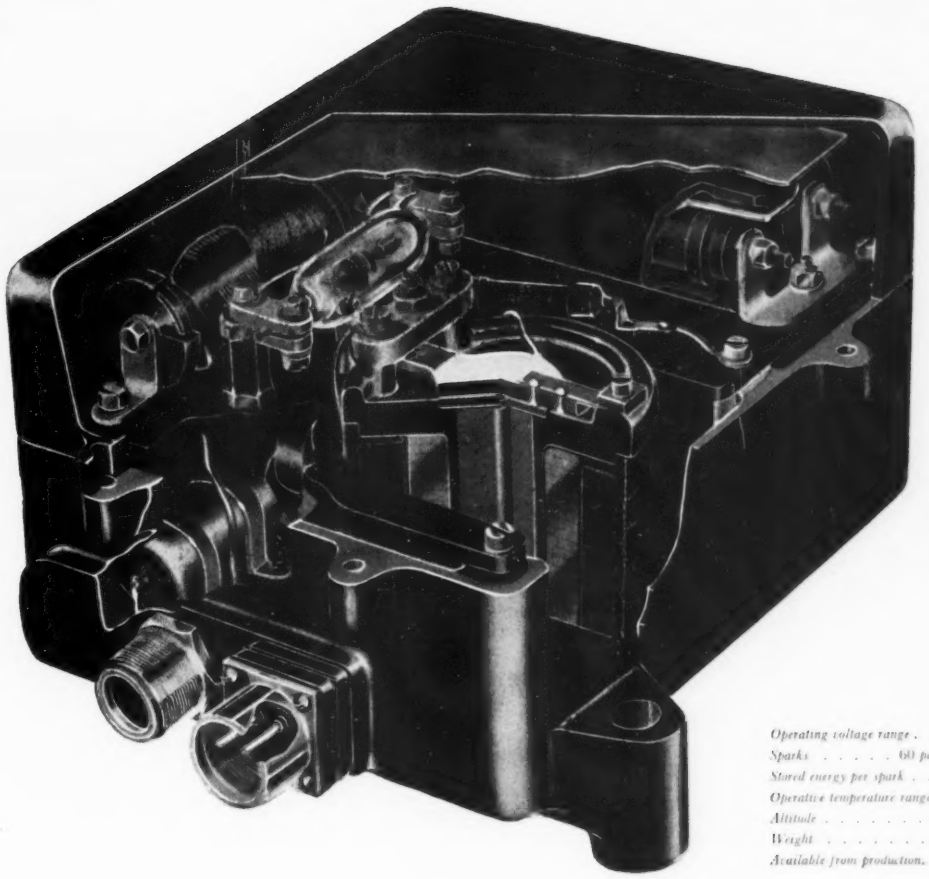
IN our introduction to Mr. O. Fitzwilliams' article last week, "The Army and the Helicopter," it should have been made clear that the author was in charge of the *Rotary Wing Section* of the Airborne Forces Experimental Establishment from 1944 to 1946; he points out that the head of the establishment itself was Mr. W. G. Jennings.

A.S.T. Pakistan School Posts

IN *Flight* of September 26th we devoted a page to the plans of Air Service Training, Ltd., for establishing two "pre-service" schools in Pakistan. It is now announced that the principal of both schools will be Mr. E. Sprawson, D.F.C., M.A., who was at one time a master at Repton, and that the headmaster of the apprentice school will be Mr. F. H. Shaw, M.B.E., formerly a housemaster at Marlborough. Mr. Sprawson served with Bomber Command during the war, was shot down over France, and escaped with the aid of the French.

Canadair Changes

IT is announced that Alexander J. Lilly has been appointed executive assistant to the vice-president, sales, of Canadair, Ltd., and will also act as flight test adviser to the vice-president, engineering. The post of chief test pilot, which "Al" Lilly has held since 1946, will be filled by William S. Longhurst, A.F.C. Lilly learned to fly in Moose Jaw in the early thirties, flew with the R.C.M.P. for six years, and later joined Imperial Airways. During the war he served as C.F.I. on the Commonwealth Air Training Plan, and as chief test pilot with R.A.F. Ferry Command. Afterwards he was with Maritime Central Airways for a spell before joining Canadair in 1946. He was the first Canadian to fly at supersonic speed. Longhurst, who has been with the company since 1947, served with the R.A.F. from 1939-1945, and later with the R.C.A.F. and with Worldwide Aviation and Wheeler Airlines. He was the first to tow a glider across the Atlantic.



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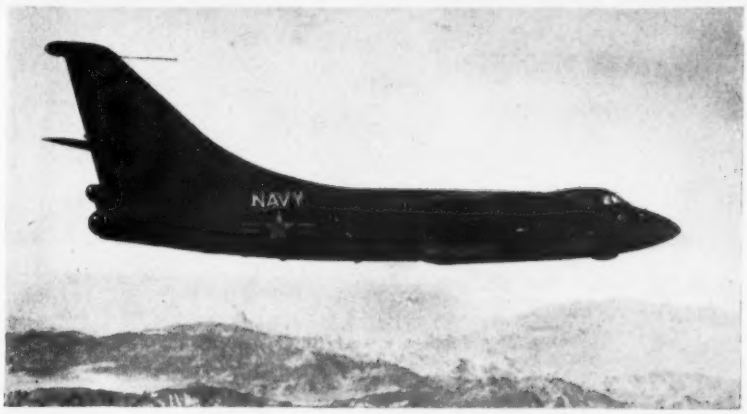


AMERICAN SAILORS: The Lockheed R7V-1 Super Constellation (top) is the fastest Lockheed transport yet built; in the U.S. Navy it will be used for many types of strategic transport. The midnight-blue Douglas A3D (below) is now undergoing its flying trials. This prototype has two afterburning Westinghouse J-40s. The swept wings and tail fold for carrier stowage.

Great Britain

Short S.B./5. Since this Derwent-powered variable-sweep aircraft is to be used for low-speed work only, it is fitted with a fixed undercarriage. This permits use of the desired thin wing-section and also overcomes many c.g. travel problems. The wing sweep is adjustable from zero to 50 deg on the ground; in flight the wing is locked.

de Havilland Vampire. On January 21st, three Vampire 52s left Hatfield for the Finnish fighter base at Pori, 155 miles north of Helsinki. They are the first jet aircraft to enter service with the Finnish Air Force, and will supplement that country's Me109Gs. It is interesting to note that Finland has followed the example of Sweden and Norway in purchasing Vampires; they will benefit from the extensive cold-weather experience gained by the Vampire in Scandinavia and Canada.

U.S.A.

Temco T-35 Buckaroo. An order for a limited number of this Chipmunk-sized trainer has now been placed by the U.S.A.F. under the Mutual Defence Assistance Programme. Other orders may be forthcoming from Latin-America and the Far East.

France

Air France aircraft. The 37 new aircraft on order for Air France have now been registered. They will be: Comets, F-BGNX to Z; Viscount 708s, F-BGNK to V; Super Constellations, F-BGNA to J; and Breguet Deux Ponts, F-BASN to V and F-BASX to Z.

Nord 2501 Noratlas. Early this month the first civil version of this Packet-like transport was demonstrated at Le Bourget. It is not yet known whether civil operators will use the type, but this machine (F-WFRG) was due to leave today for Dakar, from whence it will set out on a South American sales tour.

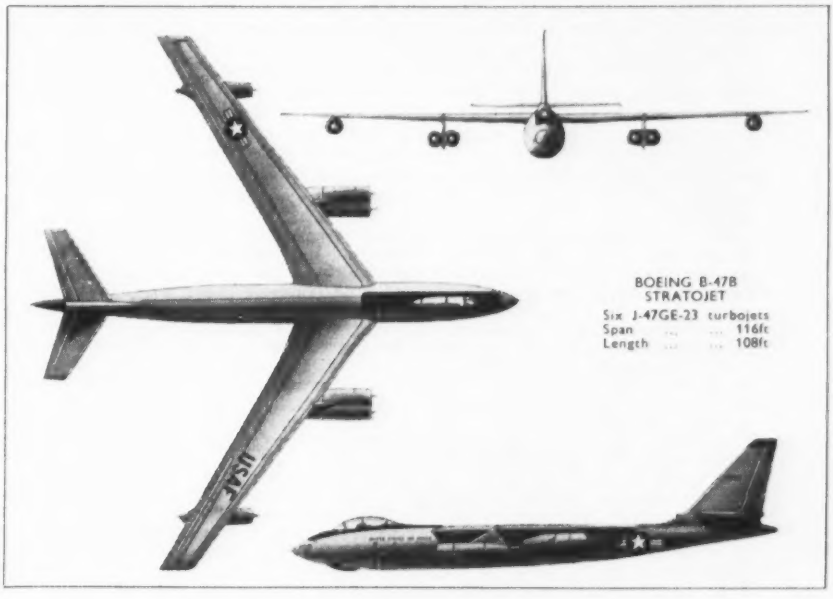
Bréguet 960 Vultur. The first prototype of this "push-me-pull-you" carrier strike aircraft was due to fly from its Toulouse home to Paris this week. From Paris it is expected to fly on to this country in order that its carrier trials may be undertaken "at an English test flight centre."

Matra Cantinieau development. Following the initial test reports on the MC.101 helicopter—which aircraft is to be quantity-produced—the decision has been taken to proceed with a twin-engined development capable of lifting a load of 880 lb (or four passengers) in addition to the pilot. The prototype, which will be shown at the Paris Salon in June, will have a single rotor driven by two SNECMA 41-02 engines of 170 h.p. each.

Bréguet 978. The French journal *Les Ailes* has recently published a description of this projected transport, which is designed to have three Atar turbojets (one in the tail) or, eventually, two Avons or Vulcains. Although the account credits the design with a "crescent wing" and suggests that it is analogous to the H.P.80, this is not correct. The Breguet project features a fuselage and fin of DC-4 shape mounted on an unswept wing whose roots are thickened by limited forward leading-edge sweep, in the manner of the Valiant. It is unlikely that the type will be built.

Jugoslavia

Jet Aircraft. The first turbine-powered aircraft of Jugoslavian design is reported to have made a successful first flight during the last week of 1952. It is a conventional low-wing monoplane with a retractable tail-wheel undercarriage. Two Turboméca Palas turbojets provide a total of some 660 lb thrust and it is suggested that the aircraft will be used as a purely experimental test bed for the development of more advanced types.



"Flight" photograph

Canadair-built North American F-86E Sabres of No. 410 (Cougar) Squadron, Royal Canadian Air Force, based at North Luffenham.

SABRE

A Study of a Renowned Fighter

THIS review has been compiled by H. F. King, with the gratefully acknowledged co-operation of the Royal Canadian Air Force and Canadair, Ltd. The illustrations include special "Flight" copyright drawings by Arthur Bowbeer, and a new set of air-to-air copyright photographs by John Yoxall.

WHEN the last piloted fighter has made its final landing and the truly great military aeroplanes have taken up their ultimate niches in history, the North American Sabre will be seen to occupy a secure place. Whether it will have influenced the course of world events as did our own Hawker Hurricane and Supermarine Spitfire it is as yet too early to be sure; but one fact can never be refuted—that, at a time of world peril, the Sabre was the only available Allied fighter which could engage the enemy's best on equal terms. Certainly an American writer's assertion that the Sabre has saved his nation's face (if not its neck) in the Korean war is no exaggeration; nor is it an overstatement to attribute this timely success to the single factor of wing sweepback—a consideration which is the more gratifying because this feature was, as we shall see, wholly adventitious.

Our short introductory history of the Sabre must open in the last year of the war—1945—when the North American company was awarded a U.S. Navy contract for three XFJ-1 straight-wing fighters of the type later to achieve a limited distinction under the name Fury. For the consideration of the U.S.A.F. a similar design, stripped of naval impedimenta and designated XP-86, was then submitted, resulting in an order for three prototypes.

Had the original XP-86 project been realized (and detailed design was carried to an advanced stage) the performance of the aircraft would almost certainly have proved inferior to that of the contemporary Republic XP-84, later to achieve fame as the Thunderjet. Thus the jet fighter which was to succeed the brilliant piston-engined Mustang almost proved a mediocrity.

This near-calamity (for, in the light of events, it might have proved a calamity indeed) was averted only by the capture of German research data which disclosed the virtues of sweepback in delaying the onset of compressibility. In conjunction with a specimen Me 262 wing, this material encouraged the N.A. technicians to redesign the XP-86 to incorporate swept-back surfaces. Their drastic revision entailed a lengthening of the fuselage and various incidental modifications, so that when the new fighter appeared in the autumn of 1947 it differed very noticeably from the straight-wing naval Fury, construction of which had proceeded as originally planned.

The first of the two flying prototypes took the air on October 1st, 1947, and was powered with an Allison J-35 turbojet of only 4,000 lb thrust.

Clearly the F-86A, as the production version was designated, was something uncommonly good. Powered with the brand-new General Electric J-47, it demonstrated not only extremely high speed, but—all things considered—surprising tractability in handling. Moreover, it was remarkable for the ingenuity of its design and construction. Its wing, in particular, was quite extraordinary. It had 35 degrees of sweepback (measured on the 25 per cent chord line), was of 12 per cent thickness/chord ratio, and its construction was of "sandwich" type, whereby the structural material was laminated between inner and outer tapered skins. Another innovation was the "lipping" of the air intake to maintain air flow in a nose-up attitude.

Though the Sabre—as the F-86 came to be dubbed—was never designed for supersonic speed, the makers did proclaim that it had been built "to come nearer the speed of sound under actual combat conditions than any other American fighter." Beyond mentioning a range of over 1,000 miles and a service ceiling of over 40,000ft, however, they disclosed little more of importance.

By September, 1948, the world suddenly became aware of the Sabre's quite extraordinary speed, for on the 15th of that month a standard F-86A, carrying its full military load and flown by Major Richard L. Johnson, U.S.A.F., established a world record of 670.981 m.p.h. over Muroc Lake—a record which was to stand until Capt. J. Slade Nash attained 699.9 m.p.h. in an F-86D on November 19th, 1952.

THE YEARS AHEAD...

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The Avro Vulcan. Four Rolls-Royce "Avon" engines

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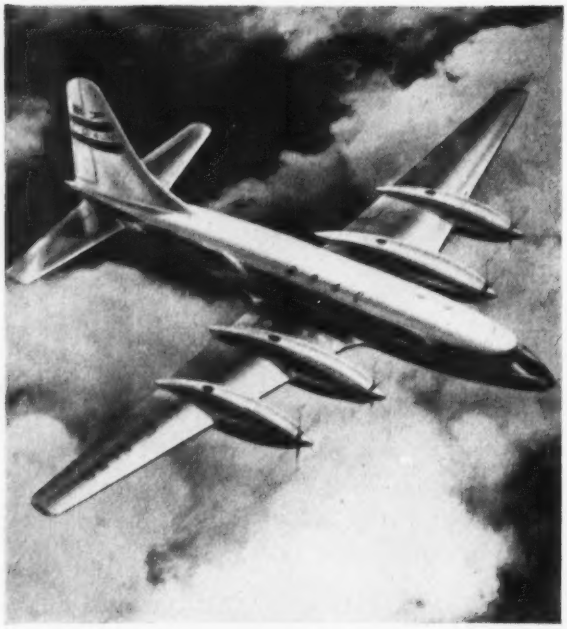

The aeroplane

The Bristol Britannia airliner.
At present undergoing tests before entering service with B.O.A.C. Four Proteus turbo-prop engines give the airliner a 5,600 mile non-stop range. Span 140′, length 114′.

the pilot

46-year-old "Bill" Pegg has been in aviation ever since he joined the R.A.F. as an air-struck apprentice of 15¼. Now he holds a well-earned O.B.E. after 17 years with "Bristol", 5 as chief test pilot. One of his greatest moments was piloting the enormous Brabazon I on her maiden flight. Has now flown over 5,000 hours in 180 different types of aircraft — including the new Britannia. Says he has "always found Shell and BP Service efficient and courteous."

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A Sabre "ripples" its 5in rocket projectiles over a U.S.A.F. firing range.

SABRE . . .

Lest it should be imagined that the Sabre has always been a paragon, unblemished by affliction, it must be recorded that not only was it heir to the ills of most prototypes, but it soon showed symptoms of altogether new complaints. To some extent these troubles stemmed from the new axial power plant: thus, the rate of climb and altitude performance of early F-86As were to say the least, suspect, while the short life of the turbojet—initially only 7½ hr between inspections—did nothing to enhance the new fighter's reputation.

In its ability to attain supersonic speed in the dive, however, the Sabre remained unique among military aircraft for a long period, though today the distinction is shared with several American, at least two British, one Canadian and one French fighter.

It was during 1948 that reports of supersonic dives over California, with their noisy and allegedly destructive consequences, began to circulate. Though the fact was kept secret for many months—and is still not widely known—it was W/C. R. P. Beamont, chief test pilot to the English Electric Company, who, flying a Sabre, became the first Englishman to achieve Mach 1 (or thereabouts). We have asked him to give us some impressions of this flight, which he made in May, 1948, at Muroc.

The aircraft was the second prototype XP-86. "As far as supersonics are concerned," W/C. Beamont writes, "I was able to obtain the necessary experience during some dives to indicated Mach numbers of well over 1. Subsequent research in this country has revealed the A.S.I. system of the production aircraft to be subject to quite considerable position error at high Mach numbers, and it is therefore by no means certain that the speed of sound was actually exceeded during that early flight of mine. It was, however, obviously transonic, if not actually supersonic, and did serve to demonstrate the remarkably docile control characteristics of the aircraft in compressibility. The marked changes in pitching moment hitherto associated with flight at Mach numbers above 0.8 were not present, and although small changes were detected—both in pitch and, as the speed of sound was approached, in roll—these involved only very small control forces to hold, or trim adjustments to trim out.

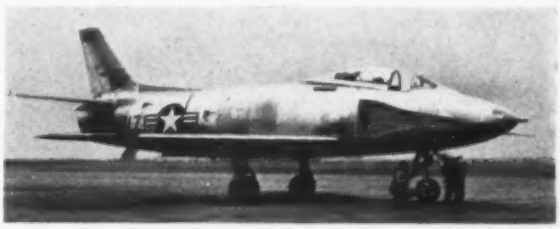
"I think that perhaps the most outstanding impression that the first flight made was that here was an aeroplane which had fighter manœuvrability up to well in excess of M = 0.9, and that it was therefore a machine with a very considerable margin of manœuvrability and smooth controllability above any known fighters of the time, either in service or under development. That impression was formed in 1948, and my last flight in a Sabre, made last year, confirmed those first impressions, although it is now a relief to know that at last there are superior prototypes under development.

"Basically the Sabre is one of the most straightforward, pleasant, and obviously efficient fighter aeroplanes that has yet occurred, and is one of the few fast aeroplanes which I have come across with which it is possible to read the Pilot's Notes and then go flying without having to keep constantly in mind some particular, if only minor, vice."

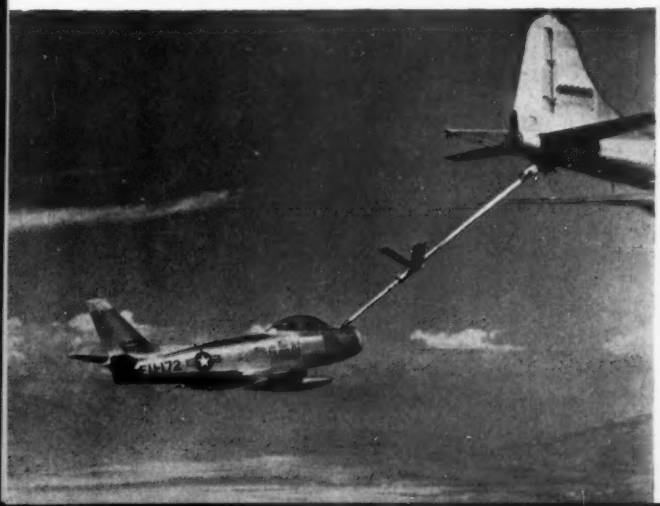
The resounding success of the F-86 in Korea (notwithstanding its slight inferiority to the Mig-15 in high-altitude performance) is now everyday talk; but its genesis is still somewhat obscure, and our description may usefully be prefaced with a note on Sabre variants.

The Sabre Family.—The two flying prototypes, as we have said, were designated **XP-86,** and though at first they were powered with Allison J-35s, these were later changed for the General Electric J-47s. The initial production model was the **F-86A,** the first of which flew on May 20th, 1948, and the last of which came off the line in October, 1950. Two machines of this type were handed over to the Central Fighter Establishment of the Royal Air Force during 1950. One "A" airframe has been fitted with an Avro Canada *Orenda* turbojet, but the standard power plant is the J-47.

(Above) XP-86 prototype. (Below) A YF-93A, powered by a Pratt and Whitney-built Rolls-Royce Tay development with afterburner.



A Sabre replenishes its tanks in the air by means of a Boeing "flying boom" lowered from a KB-29F Superfortress tanker.



The **F-86D,** present holder of the world speed record, differs very considerably both in equipment and appearance. The most notable superficial change is the installation of a prominent bullet-shaped radar housing in the nose, and the repositioning of the air intake duct, shark's-mouth fashion, below. The turbojet is a General Electric J-47-GE-17, fitted with an afterburner, and the cockpit canopy is of "clamshell" type, hinged at its rear end. No guns are fitted, but there is a retractable rocket launcher in the belly of the fuselage for a battery of R.P.s.

The subject of our description, the **F-86E,** superficially resembles the "A," but is characterized by a new "all-flying" tail, in which the tailplane and elevators are linked for co-ordinated movement. This feature gives the Sabre better longitudinal control and eliminates the loss in effectiveness of the surfaces due to

SABRE . . .

the heavy loads at extreme speeds. Another innovation on the "E" is the irreversible power-control system for which (as none of the actual air loads act upon the pilot's control column) an artificial feel system has been introduced. Although the armament of the "E" is the same as that of the "A" (six 0.5in guns), the operational effectiveness of the type has been vastly increased by the installation of radar gun-laying equipment. Certain of the Canadair-built F-86Es are designated F-86E* and are distinguished from their stablemates in that the control-column break-out force (i.e., the force required to move the stick from neutral) has been reduced from 4 lb to 1 lb, and certain changes have been made in instrumentation.

The **F-86F** is a new Sabre variant, in production at the North American Columbus, Ohio, plant and having a more powerful J-47 turbojet. Slightly larger than the "E," the **F-86H** is made at Los Angeles; it has a J-73 (much developed J-47) turbojet, an improved suspension and release mechanism for carrying the wing tanks in conjunction with bombs or rockets, and although the entire horizontal tail surfaces are power-boost controlled, as in the "E," they are somewhat larger and have no dihedral. The undercarriage has been strengthened, and the canopy is of the new "clamshell" type. All H models have an improved ejection seat mechanism. The **YF-93A** sub-type differs primarily in having a Pratt and Whitney J-48 (Rolls-Royce Tay licence) centrifugal turbojet, aspirated through flush intakes and equipped with an afterburner. The main landing wheels are duplicated and airframe dimensions differ from those of other Sabres. The two prototypes of this aircraft are now being used by the N.A.C.A. Flight Test Laboratory for high-speed research. The **Avon-Sabre,** to be built in Australia by the Commonwealth Aircraft Corporation Pty., Ltd., is based on the standard F-86E, but will be armed with 30 mm guns and powered with a Rolls-Royce Avon RA.14. Mention may also be made of the new **Sabre F-100,** otherwise known as the "Sabre 45" (which figure gives a clue to the increased sweepback on the wing) and of the **FJ-2**—a deck-landing development of the F-86E, armed with four 20 mm guns.

Our immediate concern is the Canadair-built F-86E, now familiar in this country as the equipment of the Royal Canadian Air Force squadrons based at North Luffenham, and in process of being introduced into R.A.F. units of the 2nd Allied Tactical Air Force.

Structural Features.—The wing of the F-86E is notable for the heavy gauge of the materials—particularly the skin—and, though built as a centre section and two outer panels, is made continuous through the fuselage by connecting the three sections with bolts and lock-nuts round the perimeter of the joints. The torsion-box structure, which forms the centre section and houses one of the fuel tanks, is composed of the two spars and upper and lower double-skins. Within each double-skin are the stringers. From the centre section to a point slightly inboard of the aileron each main wing panel is likewise a two-spar double-skin torsion box with very few ribs, tapered heavy-gauge skin, and closely spaced spanwise stringers in the form of hat-section extrusions. These panels contain fuel tanks.

Outboard of the sections described, the structure has only a single, instead of a double, skin, and the extreme tip portions are formed of plastic. Unlike the main torsion box, the leading-edge structure, which is attached to the front spar, has many closely spaced ribs; the trailing-edge structure is essentially similar.

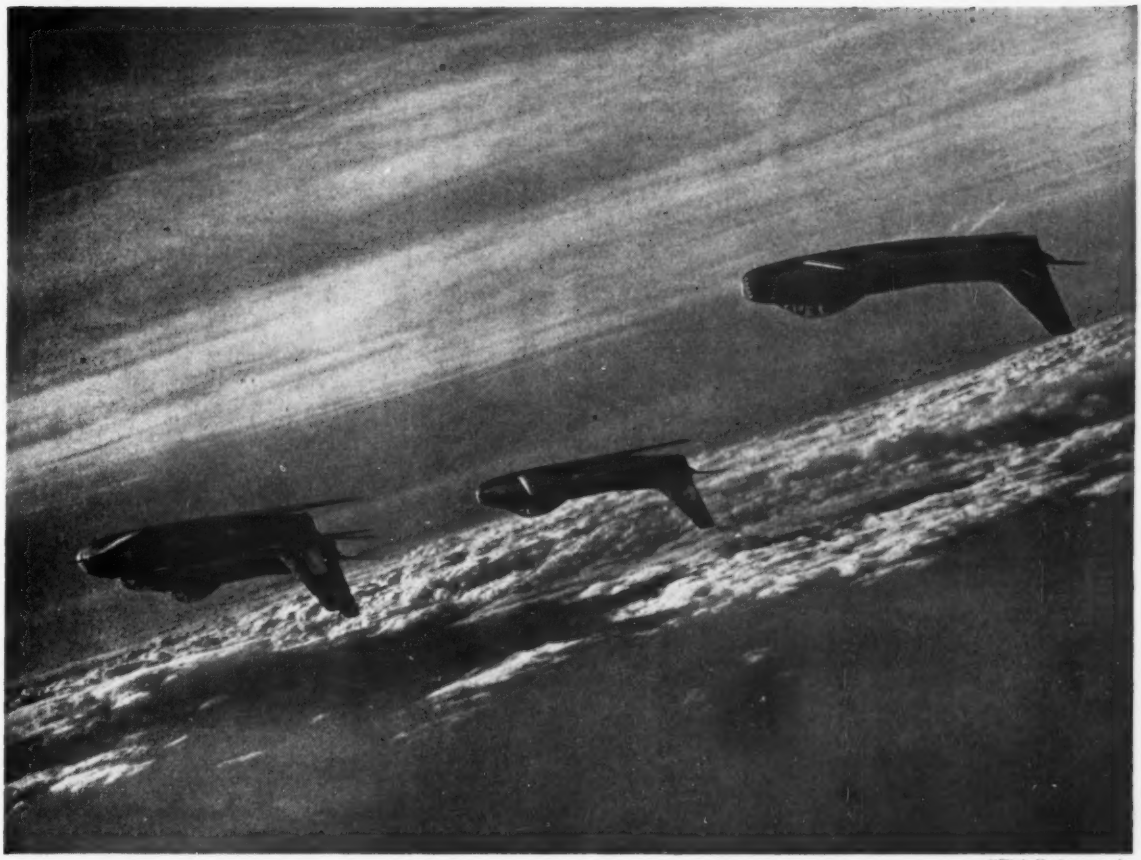
Each of the statically and aerodynamically balanced ailerons is attached by three hinges, and there is a fabric seal between the rear wing spar and the leading edge. The Handley Page automatic slats, which extend over almost the whole leading edge and are so characteristic of the Sabre, open or retract according to aircraft speed and attitude. To ensure their free working under any condition of wing distortion, each is in four loosely jointed sections which move forward and downward on tracks.

The slotted flaps are electrically operated over a range of 0-38 degrees and extend between the fuselage and each aileron. They are operated by a lever mounted beside the throttle and are interconnected by a flexible shaft to ensure unified movement under normal conditions and—in the event of one actuator failing—to permit both flap sections to be operated. The half-flap position is determined by aligning a painted stripe on the flap leading-edge with the trailing edge of the flap shroud.

Of conventional stressed-skin construction, the fuselage is built in two main sections to facilitate installation, inspection and removal of the turbojet. These two sections are joined by four bolts and there are quick-disconnectors for the wiring, control cables, and hydraulic and fuel pipes.

The rear fuselage is of simpler construction than the forward part and embodies one bay (in way of the tail) which is of stainless steel construction. On the first Canadair-built Sabres the fuselage nose-fairing was plastic, but on the later machines it is of metal, with a plastic "window" for the radar scanner.

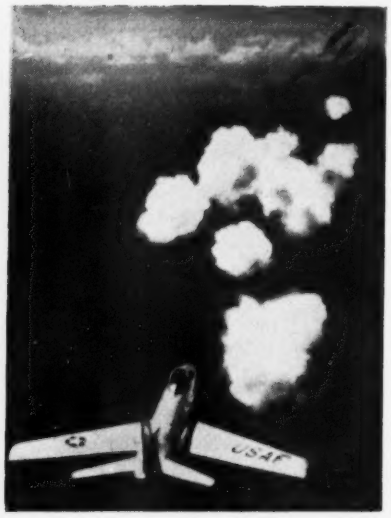
On each side of the rear fuselage are the speed brakes (this R.C.A.F. terminology seems preferable to the more usual "dive brakes" or "air brakes"), each of which is in the form of a hinged panel which can be extended forward or downward into the air



"Flight" photographs

Opposite, F-86E Sabres of No. 441 (Silver Fox) Squadron, R.C.A.F., are seen in a tidy echelon. Above, John Yoxall's camera has caught the aerobatic team of No. 410 (Cougar) Sqn. on the top of a loop, and below is a unique picture of a composite formation of North Luffenham Sabres. Nearest are four machines of No. 441 Sqn.: in the centre, four of No. 439 (Tiger) Sqn., and, beyond them, a similar representation from No. 410 Sqn.

North American F-86F. Below, a range of Sabre armament stores, including six 0.5in guns and sixteen 5in R.P.s, which are alternatives to two 1,000 lb M-65 bombs or smaller bombs, such as the 500 lb M-64 or 100 lb practice bombs, all of which are shown in this photograph.



An F-86D catches up with the explosions of the special "flash-heads" of its Mighty Mouse rockets. These heads are used by the United States Air Force for photographic recordings.

SABRE . . .

stream. The brakes are normally operated by electrically controlled hydraulic jacks, served by an engine-driven pump, and may be extended to any position from closed to open. In emergency a manual control allows them to be closed by air loads. A hydraulic accumulator, capable of providing two brake-applications, is an additional emergency measure. At medium and high engine r.p.m. the brakes take 2 sec to open and about 1 sec to close, and at idling r.p.m. about 6 sec to open and 3 sec to close.

Both the fin and the tailplane have a 35-degree sweepback, and the tailplane is set at a 10-degree dihedral angle. The elevators are statically balanced and, like the tailplane, are of straightforward stressed-skin construction. Longitudinal control is effected by *combined* tailplane/elevator movement, as described below.

The massive clear-vision cockpit canopy moves fore and aft on tracks and is normally electrically operated by a three-position switch, though there is a cable system for manual operation, in addition to the emergency ejection system. Fixed in the canopy are the loop aerial, cabin-pressure regulator and upward-identification light.

Each main undercarriage assembly is mounted on a cantilever trunnion on the rear main spar and incorporates a Cleveland shock-absorber strut, a 26in extra-high-pressure tyre and a Bendix multiple-disc hydraulic brake in a cast-magnesium wheel. Retraction (into the fuselage) is effected by a hydraulic jack, and each assembly is locked down by a pin in the aft face of the trunnion support, which engages a lug on the shock-absorber strut. The pin is actuated by a hydraulic jack and is spring-loaded in the locked position. Up-locking is achieved by a spring-loaded, hydraulically actuated hook engaging a roller on the shock-absorber leg. For combat the undercarriage control valves are in neutral and the wheel assemblies hang on their latches. A hand-pump allows emergency undercarriage operation.

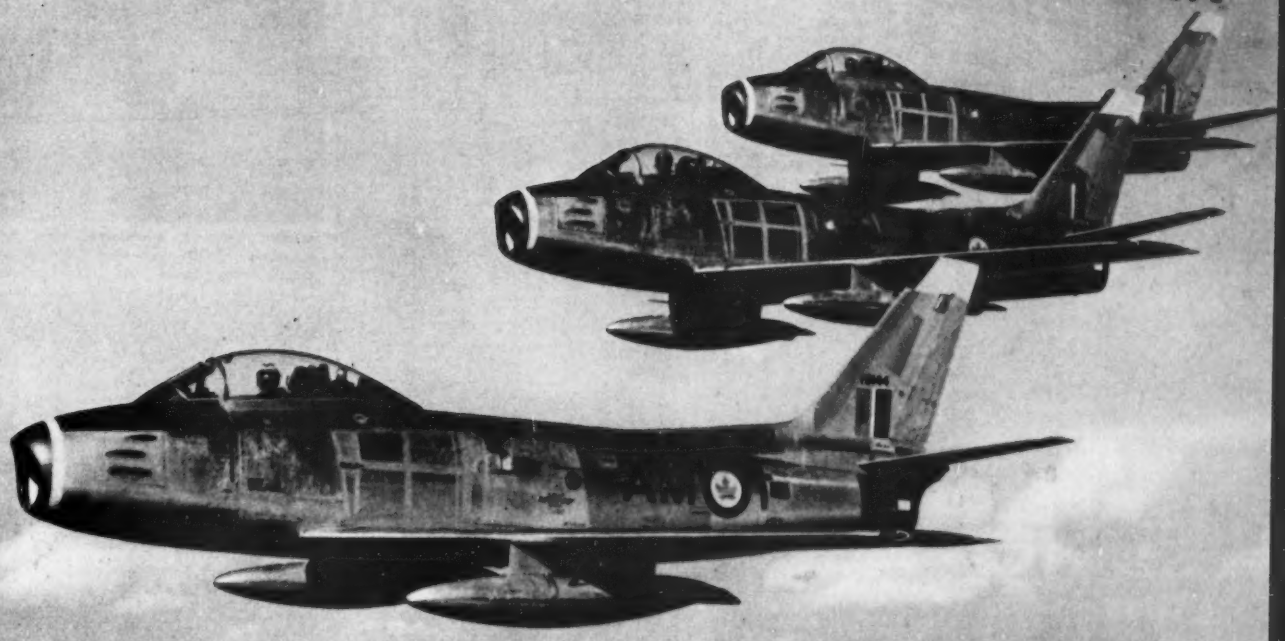
The steerable nosewheel assembly has a thin-tyred 22in wheel, and the shock-absorber strut, which pivots on two trunnions, has a steering damping unit attached to its rear. It is retracted by two hydraulic jacks and during retraction the shock-absorber spindle rotates through 90 degrees so that the wheel lies flat in the fuselage. Steering is possible (by movement of the rudder pedals) through a range of 23 degrees each side of neutral. The wheel-well door remains closed except when the wheel is actually retracting or extending.

Control System.—Of all the Sabre's unusual features, one of the most interesting is surely the control system, incorporating the "flying-tail" principle and irreversible hydraulic operation. (In R.C.A.F. parlance the flying-tail is termed "controllable horizontal tail.") Though the rudder is cable-controlled, the ailerons and the all-moving tailplane-elevator assembly are worked solely by hydraulic power in response to control-column movements. The special aileron and flying-tail systems eliminate many of the undesirable effects of compressibility such as loss of control effectiveness at high Mach numbers.

The hydraulic power system, which is entirely separate from the system for the general services (speed brakes, undercarriage, nose-wheel steering and wheel brakes) embodies reservoirs, an engine-driven pump, an electrically driven pump, a wobble pump and filling selector valve, accumulators, relief valves, pressurizing compensators, pressure transmitters, pressure switches, by-pass and shut-off valves, actuating jacks for the tailplane and ailerons, and associated valves, check valves and filters. For normal operation power is supplied by the engine-driven variable-displacement pump to the "normal" side of the control-surface valves and jacks. For emergency operation the electrically driven pump powers the "emergency" side of the valves and jacks. Check valves prevent excessive air loads from forcing the control surfaces from the selected setting. Pressure is maintained in the emergency accumulators by pressure switches which start the emergency pump when

All-rocket armament and search radar characterize the "all-weather" F-86D, now entering service with squadrons of the United States Air Force.

A NEW TECHNIQUE IN THE R.C.A.F



WITH THE Redifon SABRE FLIGHT SIMULATOR

R.C.A.F. Photograph

The Sabre (F.86E) Flight Simulator is being built in quantity by Redifon to the Royal Canadian Air Staff specification for use by operational squadrons in the U.K. and Western Europe.

In placing this contract, the Royal Canadian Air Force is ensuring that the training of flight personnel rests on the most modern and efficient foundations.

Before they leave the ground, pilots will thoroughly understand the function and positioning of all instruments, be familiar with the use of flight and power controls and be fully trained in the technique of instrument flight.

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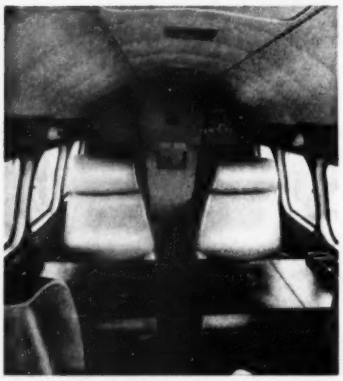
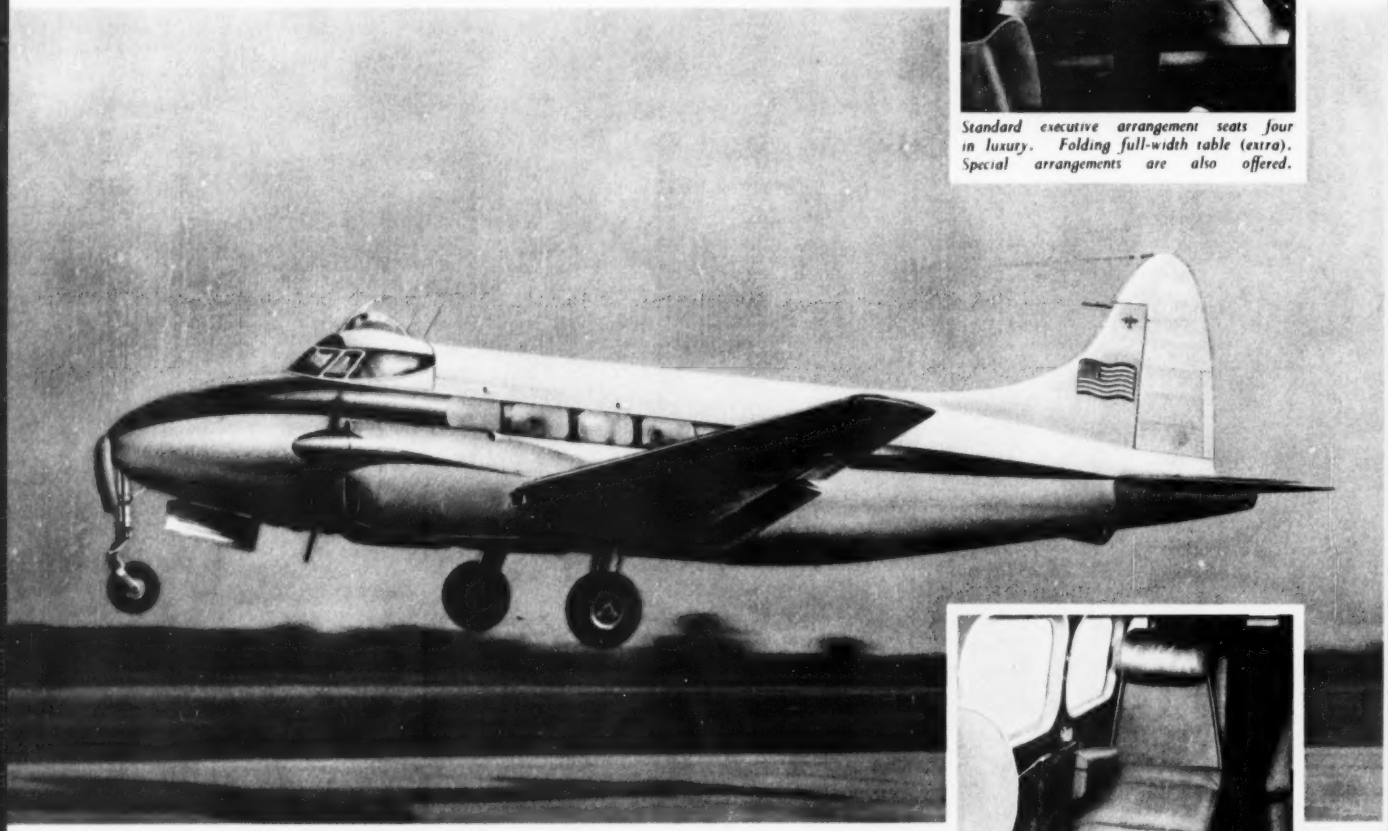
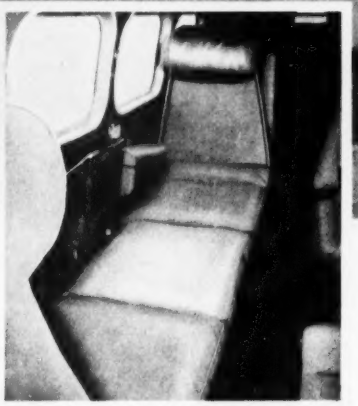
The DOVE

For the executive— an airliner in miniature



Standard executive arrangement seats four in luxury. Folding full-width table (extra). Special arrangements are also offered.





Facing pairs of adjustable armchairs are quickly convertible into softly upholstered couches.

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Factories in England, North America, and Australasia
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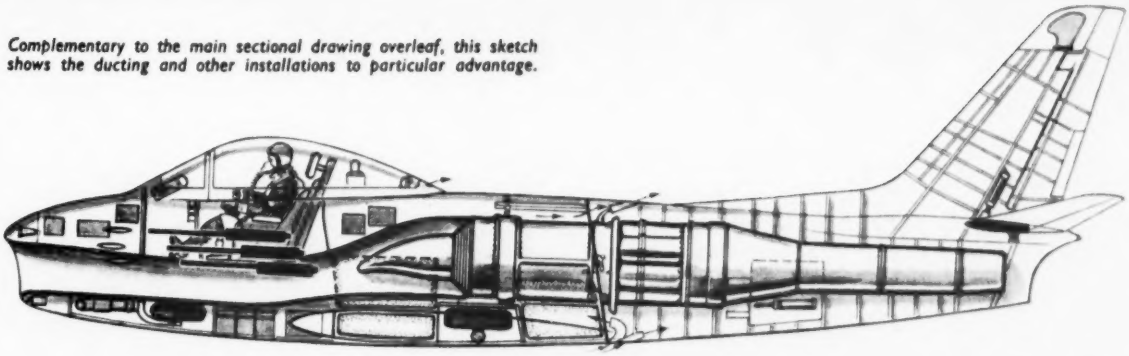
Complementary to the main sectional drawing overleaf, this sketch shows the ducting and other installations to particular advantage.



SABRE . . .

the accumulator pressure drops below 2,700 lb/sq in and stop the pump when pressure is restored to 3,000 lb/sq in. Changeover from normal to emergency operation is effected by pressure switches and two by-pass valves which are energized when normal pressure drops below 900 lb/sq in. Subsequent transfer from "emergency" back to "normal" occurs automatically if pressure is lost in the emergency system, or may be effected manually by operating a "reset" switch in the cockpit. The pilot is warned of emergency operation by a red light.

The pilot's control column serves merely to open the selector valves at the jacks, the actual control-surface movement being caused, as we have said, solely by hydraulic power. Thus it has been necessary to incorporate "artificial feel" systems to oppose pilot effort, transmit "feel" to the pilot, and impose neutralizing forces on the stick. Briefly, normal stick loads resulting from the application of g are provided through a bobweight in the tailplane and elevator linkage, and acting in conjunction with leaf springs on each side of the tailplane selector valve lever. Aileron air loads are simulated through spring-loaded struts which apply forces to the stick in proportion to the degree of stick deflection from neutral.

Lateral and fore-and-aft trim is adjusted by changing the neutral position of the control-stick and the rudder has an electrically actuated trim-tab. Alternative lateral and longitudinal trim controls are provided.

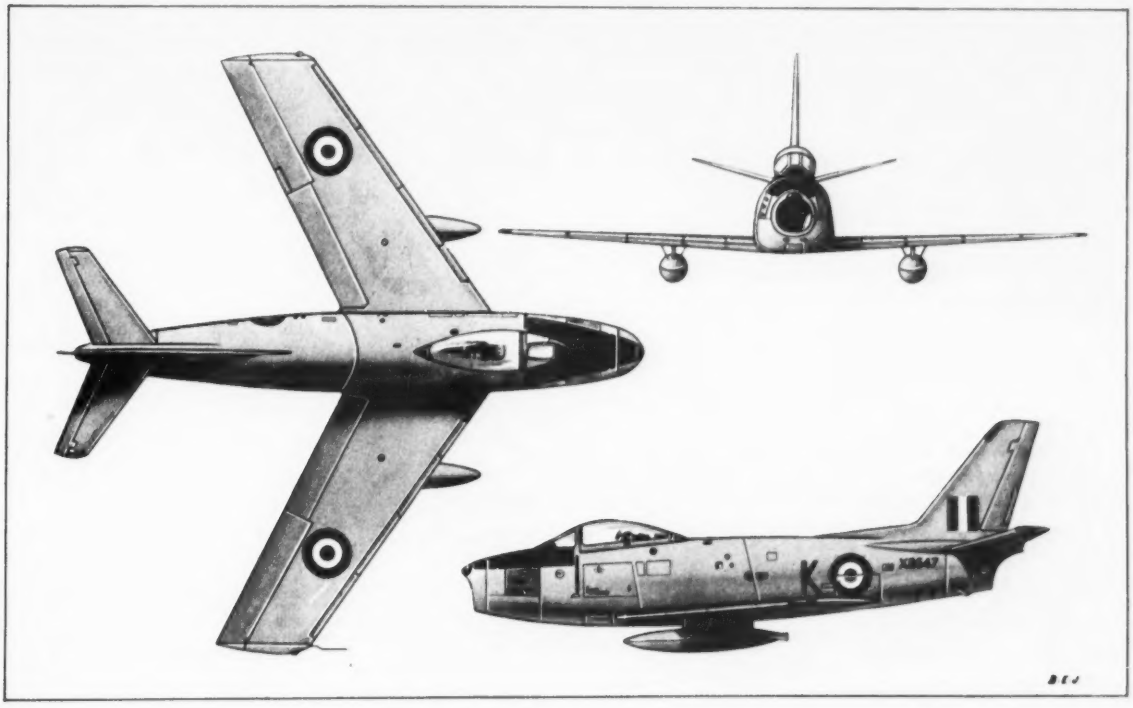
Mounted on the grip of the control column are the following controls: lateral and longitudinal trim switch; bomb release and rocket-firing switch; gun trigger; radar range-finder target selector switch; and nosewheel steering engaging switch—items which give a clue to the Sabre's elaborate equipment. Before describing the purely military items, however, it is desirable to examine the power plant, tankage and other installations.

Engine Installation.—The power-plant location and ducting arrangements will be best understood by referring to the drawings. The standard F-86E has a General Electric J-47 turbojet, characterized by a 12-stage axial compressor, eight combustion chambers and a single-stage turbine. As already noted, the power unit can be laid bare for inspection or removal by dividing the fuselage. There is a two-circuit, Edison-type fire-detector and indicating system which operates in either the forward or aft engine compart-

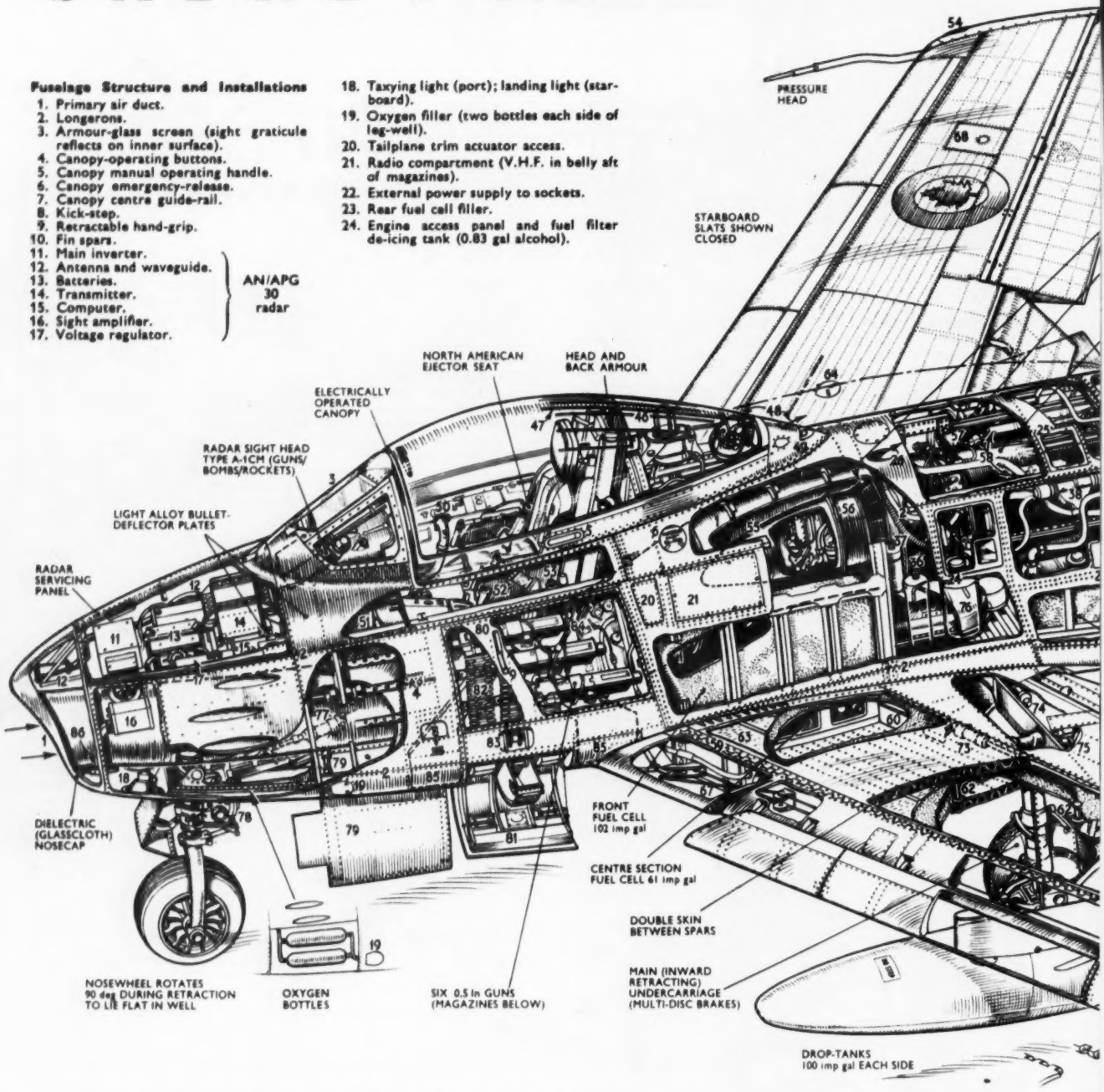
F-86E SABRE
General Electric J-47 turbojet

Span	37.1 ft
Length	37.5 ft
Height	14.7 ft
Sweepback (25 per cent chord line)	35 deg
Aspect ratio	4.785
Aerofoil section	N.A.C.A. 0012-64 Mod.
Gross wing area	287.9 sq ft
Area of speed brakes	8.6 sq ft
Total fuel	562 gal
Gross weight (with drop-tanks)	16,460 lb (approx.)
,, ,, (without drop-tanks)	14,640 lb (approx.)
Empty weight (equipped)	10,950 lb

General arrangement of F-86E Sabre, showing Royal Air Force insignia.



SABRE F-86E


PRESSURE HEAD
STARBOARD SLATS SHOWN CLOSED
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HEAD AND BACK ARMOUR
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RADAR SIGHT HEAD TYPE A-1CM (GUNS/ BOMBS/ROCKETS)
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RADAR SERVICING PANEL
DIELECTRIC (GLASSCLOTH) NOSECAP
FRONT FUEL CELL 102 imp gal
CENTRE SECTION FUEL CELL 61 imp gal
DOUBLE SKIN BETWEEN SPARS
MAIN (INWARD RETRACTING) UNDERCARRIAGE (MULTI-DISC BRAKES)
DROP-TANKS 100 imp gal EACH SIDE
NOSEWHEEL ROTATES 90 deg DURING RETRACTION TO LIE FLAT IN WELL
OXYGEN BOTTLES
SIX 0.5 in GUNS (MAGAZINES BELOW)

This is by far the most detailed sectional view of the world's first supersonic fighter to be published to date. It is illustrative, incidentally, of the complex equipment which characterizes the fighting aircraft of today.

Fuselage Structure and Installations

1. Primary air duct.
2. Longerons.
3. Armour-glass screen (sight graticule reflects on inner surface).
4. Canopy-operating buttons.
5. Canopy manual operating handle.
6. Canopy emergency-release.
7. Canopy centre guide-rail.
8. Kick-step.
9. Retractable hand-grip.
10. Fin spars.
11. Main inverter.
12. Antenna and waveguide.
13. Batteries.
14. Transmitter.
15. Computer.
16. Sight amplifier.
17. Voltage regulator.

AN/APG 30 radar

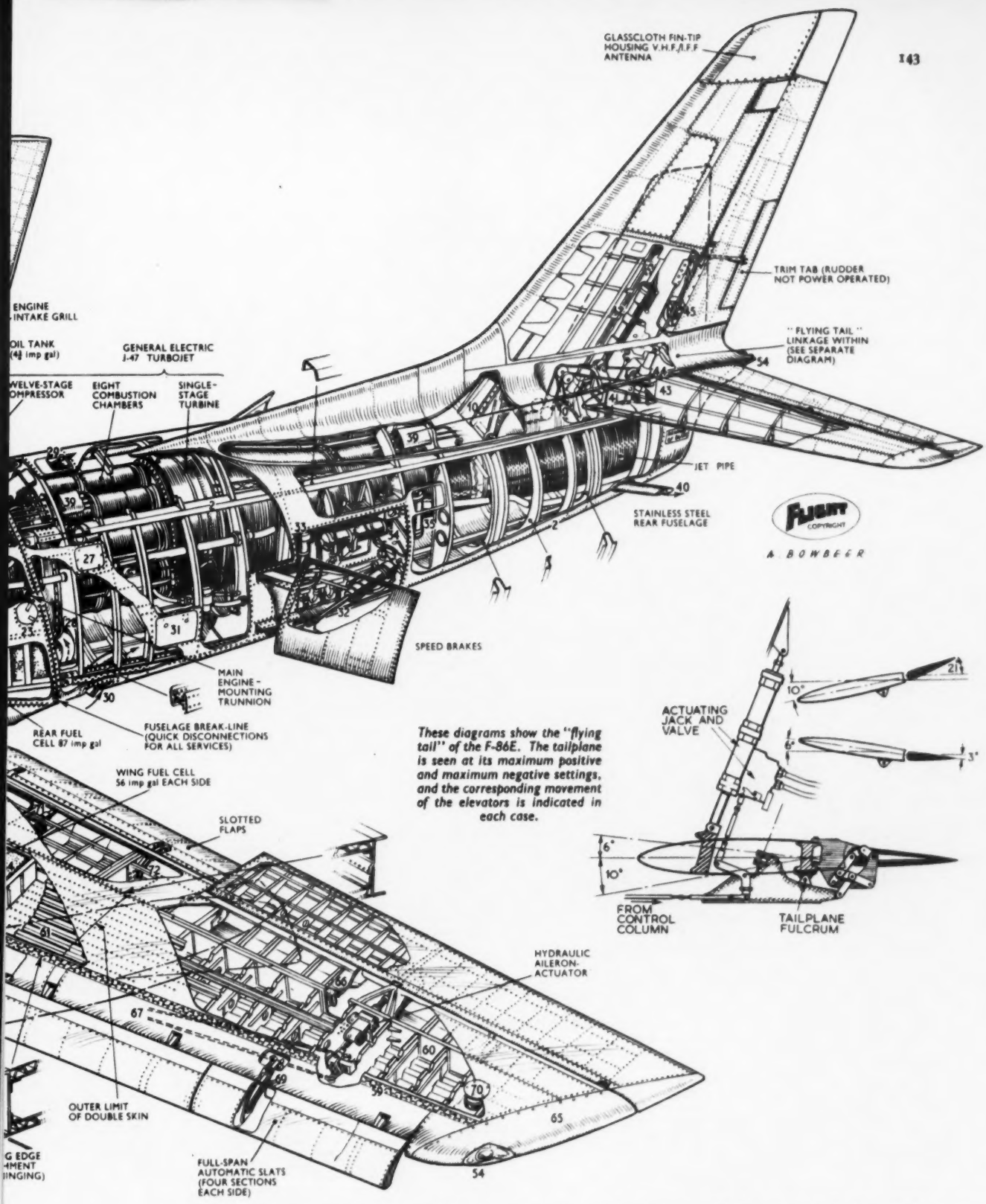
18. Taxying light (port); landing light (starboard).
19. Oxygen filler (two bottles each side of leg-well).
20. Tailplane trim actuator access.
21. Radio compartment (V.H.F. in belly aft of magazines).
22. External power supply to sockets.
23. Rear fuel cell filler.
24. Engine access panel and fuel filter de-icing tank (0.83 gal alcohol).
25. Control-surface cable adjustment access.
26. Hot outlet from air-conditioning unit.
27. Igniter plug access.
28. Compressor section ventilation air intake.
29. Compressor section ventilation air outlet.
30. Rear fuselage ventilation air intake.
31. Ground fire-fighting access; data case; power control emergency hydraulic pump.
32. Speed-brake actuating jack.
33. Emergency control reservoir.
34. Emergency hydraulic accumulator.
35. Power control compensator.
36. Power control normal accumulator.
37. Power control normal reservoir.
38. Heat exchanger (cockpit air-conditioning system).
39. Control-surface cable-duct.
40. Fuel-tank vent.
41. Tailplane front spar moved by (42).
42. Tailplane actuator jack.
43. Tailplane rear spar (hinged).
44. Rudder control quadrant.
45. Tab-actuating motor.
46. Radio compass (type ARN-6) loop antenna.
47. Radio compass sense antenna.
48. Cockpit pressure regulator and outlet.
49. Upward identification light.
50. Control column.
51. Port rudder-pedal.
52. Engine-power control.
53. Anti-g valve.
54. Navigation light

Engine

55. Nose cone (eng
56. Starter/generato
57. Engine steady a
58. Ignition units.

Wing Structure

59. Front spar.
60. Rear spar.



These diagrams show the "flying tail" of the F-86E. The tailplane is seen at its maximum positive and maximum negative settings, and the corresponding movement of the elevators is indicated in each case.

61. Corrugations between double skin.
62. Constructional posts bolted through fuel cell.
63. Glasscloth liner (anti-chafe and bullet deflector).
64. Fuel fillers.
65. Moulded wing-tip.
66. Irving balanced ailerons.
67. Aileron control cables.
68. Aileron actuator access.
69. Slat roller and guide-rail assemblies.
70. Gyrosyn compass flux unit.
71. Flap actuating motor and flexible co-ordinating shaft.
72. Flap roller-and-guide-rail assemblies.

Undercarriage Units

73. Mainwheel operating jack.
74. Uplock cylinder.
75. Downlock cylinder.
76. Wheel-well with raised portion for brake drum.
77. Nosewheel operating jack (under air-duct).
78. Steer/damp unit (nosewheel steers 23 deg each side).
79. Nosewheel door and jack.

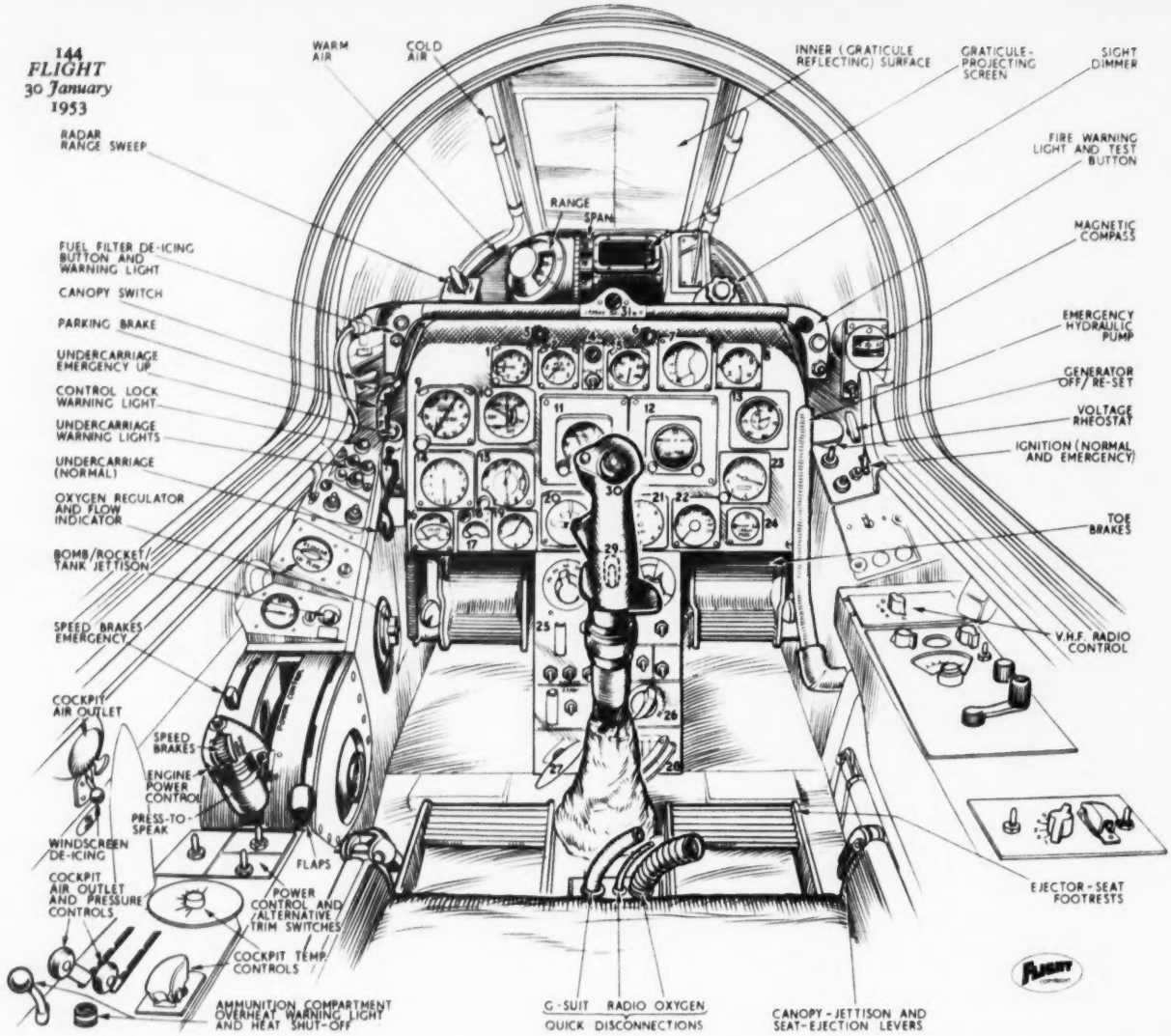
Armament

80. Gun access panel.
81. Magazine door/entry step.
82. Flexible belt-guides.
83. Feed boosters.
84. Gun-heating cables.
85. Spent case and link compartments.
86. Camera gun.

auxiliaries within).

guide-rail.

Installations



1. Accelerometer.
2. Hydraulic pressure.
3. Instrument power selector.
4. Emergency hydraulic warning light and selector switch.
5. Oil pressure.
6. Neutral-trim indicator light.
7. Jet-pipe temperature.
8. Fuel pressure.
9. Radio compass.
10. Air speed.
11. Gyrosyn compass.
12. Attitude.
13. Tachometer.
14. Machmeter.
15. Height.
16. Volts.
17. Amperes.
18. Generator warning light.
19. Clock.
20. Turn and slip.
21. Rate of climb.
22. Fuel contents.
23. Fuel flow.
24. Cockpit pressure.
25. Armament selector panel.
26. Panel lights.
27. Canopy de-clutch.
28. Emergency hydraulic selector.
29. Control lock (on panel).
30. Control column, carrying:—
    Fore/aft/lateral trim;
    Gun-firing trigger;
    Bomb/rocket firing button;
    Nosewheel-steering engagement.
31. Radar target-indicator.

The F-86E cockpit and its equipment and instrumentation. This diagram is of particular interest in relation to F/O. Seitz's flying-notes (p. 146):

SABRE . . .

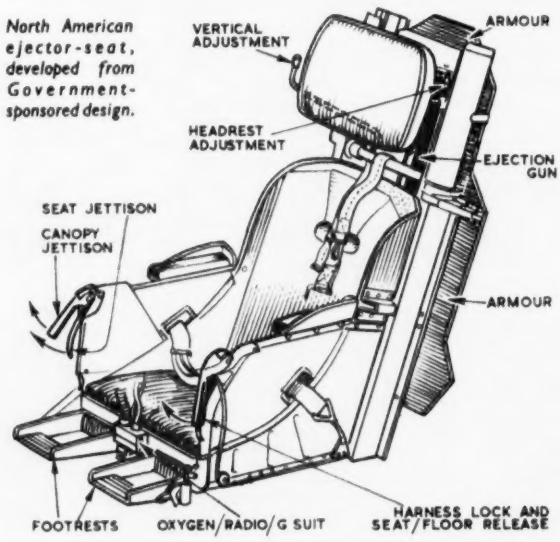
ment or in both. Nineteen thermocouple detector units are distributed throughout the engine and its compartment.

Fuel is contained in five self-sealing tanks, one in each wing, one in the centre-section, and two above it, one behind the other. The tank bays are lined with glass-cloth backing boards to protect the tanks from chafing and improve resistance to gunfire. Fuel is delivered to the turbojet from the centre-section tank, which in turn is fed from all the other internal tanks by gravity. To supplement the gravity flow from the rear tank there is a transfer pump which automatically functions when the fuel level in the centre-section tank drops below approximately 46 gallons.

Supplementary fuel is carried in two jettisonable under-wing tanks, each of 100 gallons capacity, from which the fuel is forced by compressed air to the forward fuselage tank when the quantity of fuel in that tank drops by four gallons. Experimentally, the under-wing tanks have been fitted with probes for the probe-and-drogue system developed by Flight Refuelling, Ltd.

On the later Canadair-built Sabres the "liquidometer" type of fuel-content system is replaced by a "liquidensitometer" type, in which the fuel-quantity gauge indicates the total internal fuel supply in pounds, as against gallons. This system has the merit of automatically compensating for changes in fuel density, so that a

North American ejector-seat, developed from Government-sponsored design.



In service with the Royal Navy
The Percival Sea Prince fitted
with Alvis Leonides engines

ALVIS

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Designed for high speed jet aircraft the Martin-Baker Patent Ejection Seat is fitted to this—the world's first Delta Wing Bomber

Martin-Baker
AIRCRAFT COMPANY LTD.

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SABRE . . .

true reading is given regardless of the type of fuel used, or fuel expansion or contraction.

Other Services and Equipment.—The heating, ventilating and pressurizing systems utilize air tapped from the final stage of the turbojet compressor and provide cockpit air-conditioning, pressurizing, windscreen anti-icing and ammunition-bay heating. Below 12,000ft the cockpit is not pressurized, but at greater heights pressurizing air is delivered from the compressor through conditioning valves and circulates and increases in pressure until the differential reaches 2.75 lb/sq in or 5 lb/sq in, depending on the setting chosen by the pilot and the altitude of the aircraft. Pressure in excess of these differentials is relieved through a regulator. If additional heat is required this is automatically supplied by an electric cockpit heater. Warming of the ammunition bay is thermostatically controlled and a cockpit light gives warning of unsafe heat. The oxygen system is of low-pressure type, capable of supplying oxygen for about 4 hr at a height of 25,000ft.

The windscreen is defrosted by heated cockpit air which is led through three outlets. Perforated tubes along the windscreen and canopy tracks direct engine-compressor air for supplementary canopy defrosting. De-icing of the windscreen is achieved by circulating engine-compressor air between the outer screen and the armour glass. There is an air heater which provides additional warmth automatically when necessary.

A 28-volt system, powered by a 400 amp hr generator, provides electric current, and a 24 volt, 34 amp hr storage battery serves as a standby.

The Sabre is the first fighter fully described in this journal in which anti-g-suit equipment is standard. This equipment consists of a pressure-regulating valve, a suit-attachment fitting, connecting hose, a quick-disconnector block on the pilot's seat (a safety measure in the event of emergency ejection), and tubing to the turbojet compressor. Compressed air is delivered to the anti-g bladders through the pressure-regulating valve, which starts to function at a predetermined g loading, depending on the setting of a special valve marked "Hi" and "Lo." At accelerations above 1.75g (with the valve set to Hi or Lo) this valve opens, causing inflation of the suit. For every increment of g a corresponding pressure of 1 lb/sq in (Lo) or 1.5 lb/sq in (Hi) is exerted in the suit. Momentary inflation—which can lessen fatigue on a long flight—is possible by means of a button on the valve.

The cockpit instruments are classified in three groups—"flight," "engine" and "miscellaneous"—and their dispositions are seen in one of our drawings.

The pilot's ejection seat has fixed armrests and footrests, and an adjustable headrest. Just forward of the armrests are two handgrips which are hinged to pull up to a vertical position prior to ejection. The trigger lever is located beneath the right handgrip and is normally protected by a guard and safety wire. When the grip is pulled up preparatory to ejection, the safety wire is broken and the trigger projects from its guard. On ejection the anti-g-suit connection, oxygen hose, microphone and headset leads are automatically disconnected at a junction box fixed to the seat beneath the footrests. When the trigger is operated the shoulder harness locks, the canopy seal deflates, the canopy ejector fires, and, finally, the ejection-seat catapult fires.

On the back of the seat is an "inertia-reel" for the shoulder harness, which automatically locks the harness at accelerations of over 2.2g.

Armament.—The standard built-in armament of the F-86E is six guns of 0.5in calibre, disposed in two banks of three guns each in the sides of the forward fuselage, with the ammunition magazines below. The belts are assisted from the magazines by booster motors. As is well known, the remarkable success of the Sabre in Korea is largely attributable to the fire-control system which, although details are still secret, is known to embody an automatic range-determining device which tells the pilot when he is "on target" and is used in conjunction with an "all-purpose" sight, developed for use with guns, bombs and rockets.

Built in to the under-surfaces of each wing are fittings for carriers suitable for bombs ranging from 100 lb to 1,000 lb in weight or anti-personnel bomb clusters. Alternatively, eight zero-length rocket attachments, providing mounting for sixteen 5in projectiles, can be installed.

The electronic equipment consists of a V.H.F. transmitter receiver, radio compass, I.F.F., and the fire-control gear.

So much for the Sabre in detail.

Canadair's Part.—We have already acknowledged the design and constructional skill of North American Aviation, Inc., the parent company responsible, and it remains to place on record the part played by Canadian and British companies in the vast Sabre programme. Finally—and we take special pleasure in this—we print some flying impressions from the pen of one of the North Luffenham Sabre pilots. We begin with the Canadair story.

Having decided in 1949 that the Sabre was the logical choice for its first-line fighter force, the R.C.A.F. called upon Canadair, Ltd., of Montreal, as the one Canadian manufacturer capable of turning out these machines in a hurry. The original contract—for a hundred F-86s—was signed in August, 1949, and specified that the first aircraft should be delivered twelve months later. Canadair's history of meeting contract dates merely repeated itself when the first F-86 rolled off the assembly line on schedule.

A leader in civil-aircraft construction at that time, Canadair took readily to its new and vital task of building the swept-wing supersonic fighters, and the original order of 100 was soon increased substantially.

The first Canadair-built F-86 was of the A series as specified in the contract; but almost as soon as this model went into production the R.C.A.F. decided to adopt the later series E. Thus, only one F-86A was completed in Canada.

Soon after the Sabre had gone into production, a call came from the United States Air Force for sixty machines to bolster its fighter strength for the Korean war. These have all been delivered and it is known that a number of them have seen action in Korea. Then, when Canada decided to equip and send a 12-squadron air division to Europe as one of its contributions to NATO, the F-86 was chosen as the standard fighter.

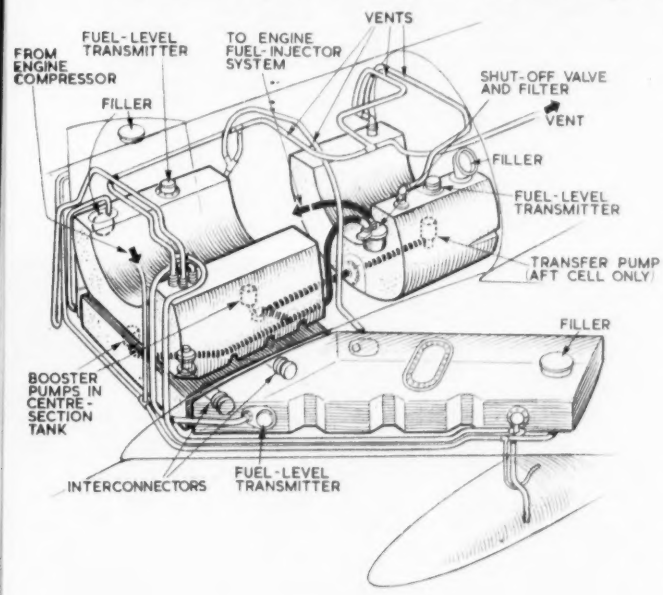
The six R.C.A.F. squadrons overseas—three at North Luffenham and three at Gros Tenquin, France—are, with the exception of a few American units, the only NATO forces equipped with fighters of this calibre. This situation will soon be rectified, however, for the Royal Air Force is receiving between 300 and 400 Canadair-built Sabres, the engines and other equipment for which are supplied by America under Mutual Aid arrangements.

All Sabres manufactured by Canadair have conformed to the North American design and have been kept up to date on all modifications. At a particular point in the programme the airframe will be adapted to take the Orenda turbojet, soon to be delivered in quantity by A. V. Roe Canada, Ltd. Canadair engineers are still busy making the necessary adaptations to fit the Orenda into the production airframe, for the Canadian engine is considerably larger than the General Electric J-47, and production of Orenda-Sabres will not be under way for some months.

By Spring, the Canadair plant at Cartierville, outside Montreal, will contain more than 2,500,000 sq ft of covered factory space—almost 60 acres—and surrounding it there will remain approximately 40 acres available for expansion. In addition, there is a three-strip airfield operated by the Department of Transport.

The main portion of the present Plant No. 1 was built in 1942 after a survey of the latest production layouts in North America. Since that time, Canadair has added considerably to the original space and is today augmenting it with another 200,000 sq ft. Plant No. 2 was operated during the war by the Noorduyn Company for the manufacture of Harvards, and is leased from the Crown by Canadair. Plant No. 3 is a repair depot at nearby Dorval Airport, while Plant No. 4 is the recently acquired space (165,000 sq ft) formerly occupied by the aircraft division of Canadian Car and Foundry. Additions to the already immense

The fuel tanks of the Sabre are "tailor-made," filling every available cubic inch. The cut-outs in the wing tanks are for the slat guides.



SABRE . . .

floor space are the two warehouses covering a total of 274,000 sq ft. In addition, there are a number of hangars and other buildings which can be described as small only in a relative sense.

At present, Plant No. 1 handles production of the Sabre and houses the machine tools, presses and other equipment necessary to its manufacture.

All assembly operations on the Sabre—minor, major and final—are performed at Plant No. 2, which has been described as one of the most efficient aircraft assembly plants in the world. In all, almost 1,250,000 sq ft of space are now devoted to the F-86.

Additional to the 2¼ million-odd sq ft of space soon to be occupied, approximately a quarter as much is being utilized by sub-contractors to carry on their portion of the work.

In Plant No. 1 is the machine shop and the sheet-metal and tooling departments. Milling machines, lathes and grinders of every type and size necessary for aircraft production are housed here. There are more than sixty milling machines of various types—universal, horizontal and vertical—ranging from three to 60 h.p. The machine shop includes 35 engine lathes and 24 turret lathes, as well as grinders of every description.

While many processes at Canadair are standard for large industrial concerns, others are of special interest. Two impressive machines in the sheet-metal working department are the 5,000-ton and 4,000-ton hydraulic presses.

One large machine which never fails to catch the eye of the visitor is the Hufford stretch former of 150-ton capacity which grips a sheet of aluminium up to 66×144in at either end, stretches it slightly to remove all resiliency, then wraps it over a die. This department also contains smaller stretch formers as well as 21 punch presses, providing a complete range.

Then there are such specialized departments as that for heat-treatment, with furnace capacity for all types of dural and steel and copper furnace-brazing; the plastic shop, with all facilities for die-making in rezolin, plaster and kirksite; and the welding department—with a complete range of flash, spot, seam and tack welding.

Many machines—i.e., the stretch-former and skin-millers—were purchased expressly for F-86 production, while others were acquired to duplicate similar machines already in the shops in order to ensure the proposed production rate.

To keep these and the many other machines in operation requires a large labour force, and at present more than 11,000 are employed. Of these, about 3,500 work directly on the F-86. Thus, a great company is playing its part in Canada.

Sabres in Britain.—Here, too, famous names are linked with the Sabre programme, notably that of the Bristol Aeroplane Co., Ltd. In recent years this company has followed a policy of progressive expansion of its Canadian interests and it is a particularly happy arrangement, therefore, that it should be responsible for the repair and overhaul of all Canadair Sabres now in Gt. Britain.

Negotiations between Bristols and Canadair, Ltd., regarding overhaul arrangements had begun some months before the first R.C.A.F. Sabres arrived in England—in November, 1951. The first approach had been made in August of that year by, appropriately, an old friend of Bristols, Mr. Tim Sims, who piloted a Bristol Freighter on its 41,000-mile demonstration tour through North and South America in 1946. To acquire the necessary technical background, a team of Bristol engineers and technicians was sent to the Canadair plant towards the end of 1951. They were joined by Mr. R. Ellison, the company's assistant chief test pilot, who happened to be in Canada at that time.

From the first moment of contact between personnel of the two organizations, it was clear that there was an admirable spirit of co-operation on both sides—a cordial relationship which has been maintained ever since and has greatly facilitated progress.

In North Luffenham's early days as an R.C.A.F. base, the volume of work was comparatively light, but it was clear that as further squadrons arrived and the wing approached its complete establishment, the demands on the Bristol service organization would be considerably increased. Work was divided into two categories—repairs which could be handled on site, and extensive overhauls which, it was decided, would be handled at Filton. As the first preparatory step, a Sabre was sent to Filton for examination by servicing personnel, shortly after the first squadron's arrival at North Luffenham. A little later, two Bristol test pilots went to North Luffenham to take a conversion course.

The first Sabre to be serviced was accepted on March 10th, 1952, by the team of Bristol technicians at the North Luffenham base, and within 15 days was once again airworthy. Since then, work on site and at Filton has increased steadily, ranging from minor to extensive repairs.

The major overhaul period for Sabre aircraft in this country has yet to be decided. When it is settled, a regular flow of work may be expected. The Bristol company is well equipped for the task. The supply of spares from the material base at Langar is prompt and comprehensive, and a large stock, ranging from small parts to major components, has been established near Bristol, under the supervision of an R.C.A.F. Supplies Officer. In addition, a Canadair representative is stationed permanently at Filton.

The company is also responsible for the overhaul of the Sabres' J-47 turbojets. Planning and shop layout is proceeding in the Engine Division and deliveries of engines for overhaul are expected to begin in the spring of 1953.

The task being undertaken by Airwork, Ltd., at Speke entails the storage, rapid servicing and modification of Sabres on behalf of Canadair, Ltd., and to the instructions of the various Wings of the R.C.A.F. stationed in Europe. Technical liaison is controlled from the R.C.A.F. Station at Langar, which unit is also responsible for Nos. 2, 3 and 4 Wings in Europe.

The wide experience of the Airwork organization has enabled it to undertake tasks of this nature without much inconvenience, and it is hoped that early this year the whole organization at Liverpool will be working smoothly. Most of the staff to be employed at Liverpool will be engaged from local sources, with the exception of a few key personnel transferred to Speke from other of the company's branches. A large number of Airwork personnel have been to Canada for training during the past year and the experience they gained there is proving invaluable.

Airwork will also have working parties positioned with the various Wings in Europe—an arrangement which is unique in entailing the employment of large numbers of British personnel in European countries, working in close collaboration with the Fighting Services. An R.C.A.F. ferry service for aircraft spares is being organized from this country and will eventually be flown daily. The inconvenience of working in Europe will be considerably lessened by the regularity of this air lift.

The arrival of Sabres at Speke has roused considerable interest in the Liverpool area; these are, in fact, the first jet fighters seen at close quarters in that district. Whether the local residents will continue to put up with their noise without comment remains to be seen, but most of them look upon the development as a useful one for the neighbourhood.

The Ministry of Civil Aviation has been most helpful in getting this scheme under way at Speke and without its help such rapid progress could not have been made. Airwork hopes that in building up this useful unit as a contribution to NATO it will be able to extend these activities to many of a similar nature now being contemplated by the United Nations Forces in Europe.

Care and maintenance of the electronic equipment of R.C.A.F. Sabres in Europe has been entrusted to Vicom and Co., Ltd., of Bourn, Cambs, and Redifon Ltd. is producing a special F-86E flight simulator to R.C.A.F. specifications.

FLYING THE SABRE

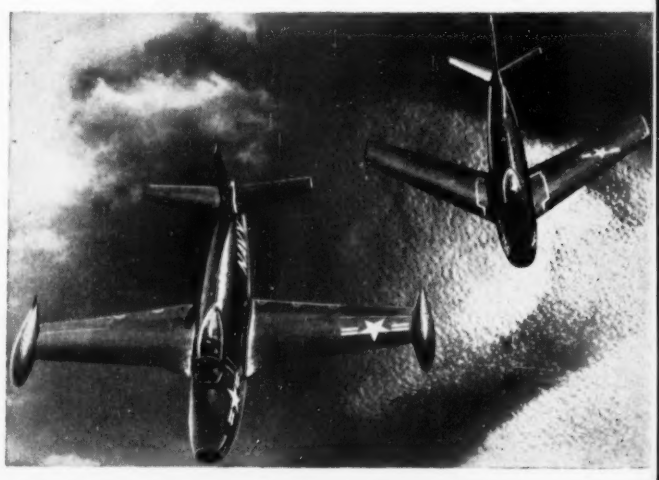
By F/O E. A. Seitz, 439 Fighter Squadron, R.C.A.F.

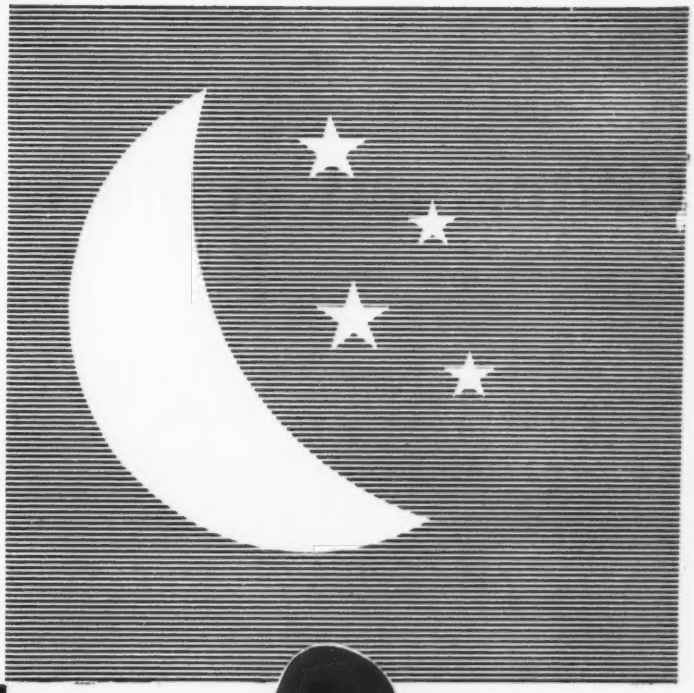
ON first sight the Sabre appears to be a rather large aircraft for a fighter, but its dimensions are actually slightly less than those of a Meteor. Its undercarriage is long and is largely responsible for the impression of hugeness.

Entering the cockpit and strapping into the safety harness is probably the most awkward operation of an entire flight. Being strapped, one finds that the cockpit is quite roomy lengthwise but rather cramped for a pilot with broad shoulders.

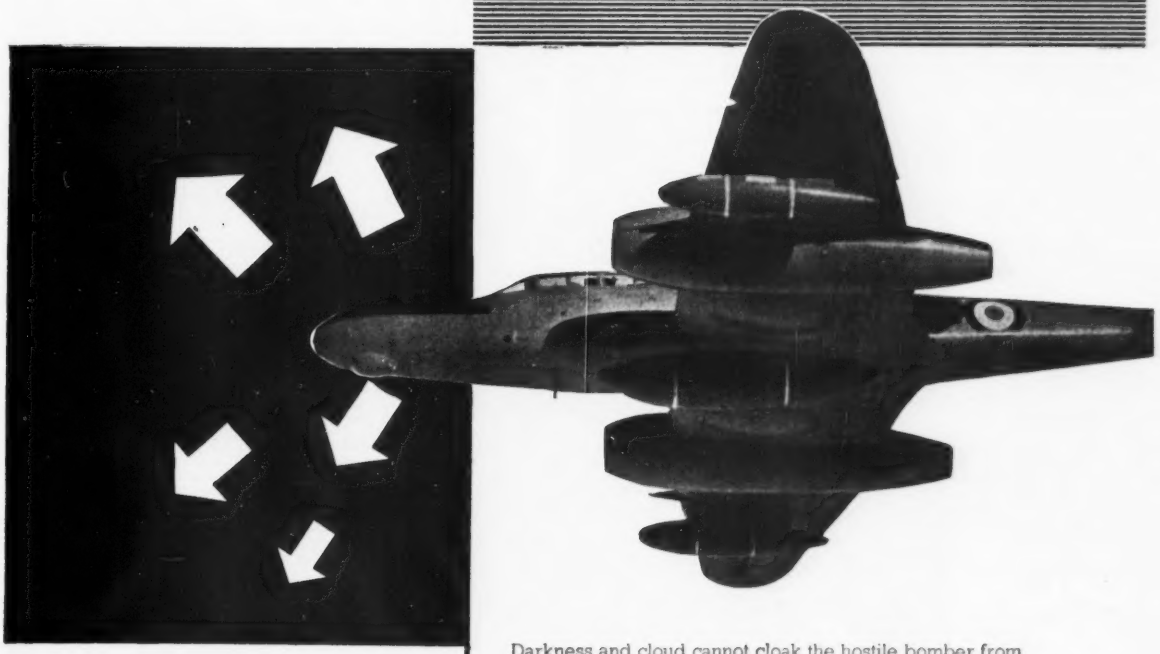
Just behind either elbow is an impressive array of circuit breakers, as practically every electrical circuit is represented. The console on the right side of the cockpit carries the controls for navigation lights, emergency ignition switch, generator reset switch, master switch, and the battery starter switch. On the left console are the drop-tank on/off handle, cabin pressure and heat controls, flap lever, and throttle. Incorporated on the throttle are,

A straight-wing deck-landing FJ-1 Fury (left) with an FJ-2 (also known as Fury). The FJ-2 is a "navalized" version of the Sabre which, as related on an earlier page, was itself descended from the FJ-1.





N.F.11
...its radar turns night into day



Darkness and cloud cannot cloak the hostile bomber from detection and ruthless pursuit by the N.F.11 Night Fighter. Guided by complex, quick-ranging radar, the N.F.11 is fast, manoeuvrable, has a terrific rate of climb and is heavily armed with four 20 mm. wing-mounted cannon. Deliveries to the R.A.F. are being made against production orders which have been placed with Armstrong Whitworth Aircraft; and this deadly night fighter now takes on a major responsibility in the defence of Western Europe.

ARMSTRONG WHITWORTH
N.F.11

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Editor and publisher of *American*

Aviation praises performance of

B.O.A.C. Comet jetliner

A few hours after reaching Singapore from London last September by B.O.A.C. Comet jetliner, Mr. Wayne Parrish wrote his impressions of the flight for his magazine.

"As a passenger," reported Mr. Parrish, "I was mightily satisfied.

"In some hundreds of thousands of miles of flying throughout the U.S. and the world, this Comet trip has been tops by a considerable margin.

"The absence of vibration is astonishing. Flying in the Comet is both easy and tireless . . . I had the feeling that our Comet was being towed, that we were being carried through the air rather than forcing our way through it. This is another relaxing feature—the detachment of the passenger from the power plant."

Limitations of space prohibit our quoting Mr. Parrish's fine tribute to the British-built Comet in its entirety. Suffice it to observe that he had only nice things to say about the Comet, and said them with sincerity and whole-hearted conviction.

POSTSCRIPT TO PRAISE

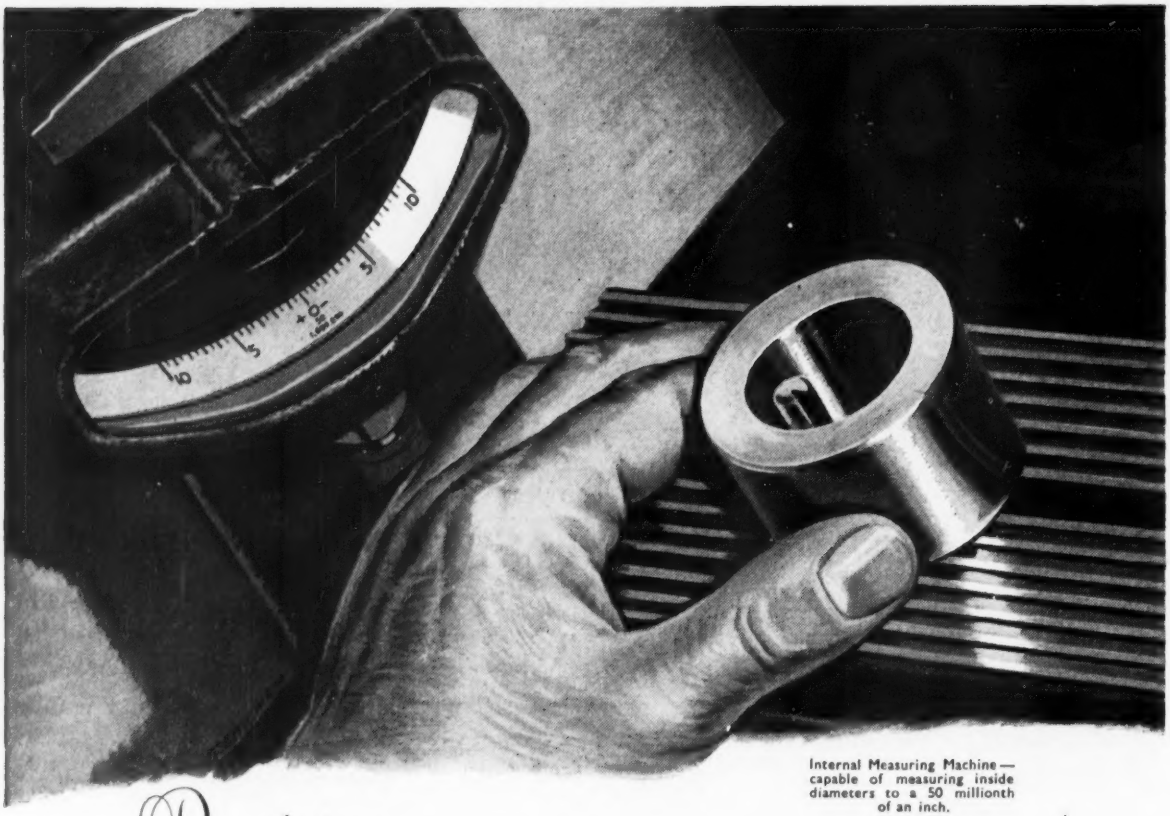
Two weeks after writing the above, Mr. Parrish was moved to further editorial comment :

"There is only one change I would make if I were re-writing the article immediately after completing the 7600-mile flight to the Far East. This change involves the noise level of the jet Comet. I didn't give sufficient credit to it. The noise level is lower—and more satisfactory—than I attributed to it in Singapore and the reason, I am sure, is that after flying that distance with the Comet I had forgotten how noisy are piston-engined airplanes."

B.O.A.C. TAKES GOOD CARE OF YOU

FLY BRITISH BY **B·O·A·C**

BRITISH OVERSEAS AIRWAYS CORPORATION



Internal Measuring Machine—capable of measuring inside diameters to a 50 millionth of an inch.

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The building of super-sonic aircraft demands super-sensitive equipment. There can be no compromise . . . no variation. Quality and precision are the watchwords.

At Canadair, technicians constantly seek new methods . . . more sensitive instruments . . . finer tools . . . more delicate machines: *at Canadair precision counts.*

Skilled Canadian workmen, raised in a tradition of fine handicrafts, are today working in every department of Canadair . . . "putting lasting quality into the planes she builds."

For further information: European Representative, J. H. Davis, Princes House, 190 Piccadilly, London, W.1., England.

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Vignettes of
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In the transport of men and materials on the great Kitimat project, in Canada's British Columbia, the helicopter has contributed tremendously in the building of this new aluminum empire.

Industrial and aviation circles are finding new uses for this nimble workhorse of the air. Flying into deep gullies . . . to the top of jagged mountain peaks . . . reaching into the farthest, most rugged and inaccessible areas . . . the versatile helicopter now plays a vital role in Canada's industrial development.

Since flying began, Canada has been an airminded nation, and as new uses for aircraft are discovered, Canada will lead in applying them to her way of life.

Assembly of North American F-86E Sabres in the No. 2 Plant of Canadair, Ltd., which has been leased from the Crown.

SABRE . . .

among other things, the speed brake selector switch and the microphone button.

The instrument panel is set well forward and although the blind-flying group is not standardized, as is the case with the majority of British aircraft, all dials are easy to see. Not so the armament controls, however, which are on a pedestal below the main panel and are directly in front of the control column. They can be reached only with the safety harness unlocked.

The adjustable rudder-pedals, with brakes incorporated, are set in tunnels on either side of the armament pedestal. On the upper extremity of the stick, which is of the pistol-grip type, one finds five buttons, or switches, the lowest of which actuates the nosewheel steering. Above this is the gun trigger, operated by the index finger. On top of the stick is the bomb-release and rocket-firing button, as well as the elevator and aileron trim button, both of which are operated by the thumb.

The flight controls of the Sabre, with the exception of the rudder, are completely hydraulically operated. This means that they are irreversible, and therefore cannot flutter at high speeds. As a result it was necessary to install an artificial feel system, and it is therefore obvious that the controls feel exactly the same regardless of air speed. Pilots soon become accustomed to this idiosyncrasy and generally prefer this type of control to any other. With it the normal type of trim tab cannot be used, of course, so the use of trim merely moves the centralization of the "feel system". This is accomplished simply by pressing the trim button in the desired direction with the thumb. The rudder, which is manual, has a normal electric trim tab, is actuated by a spring-loaded switch on the left console.

Once started, the Sabre is one of the pleasantest and easiest machines of its class to handle, both on the ground and in the air. Very little power and practically no brake are required in taxying. For take-off the airplane is held on its brakes and the throttle is opened to 80 per cent r.p.m. Upon release of brakes the throttle is advanced to fully-open position and the machine accelerates—rather slowly as compared to a Meteor—to its unsticking speed of about 125 kt. It does not unstick cleanly, but rather wallows into the air with an extremely high angle of attack. However, it picks up speed rapidly after wheels and flaps are raised. Roughly 30 deg of flap is used to take off, as the run would be considerably increased without flap.

If held down until its ideal climbing speed, in the region of 400 kt, is reached, the Sabre has a rate of climb of better than 7,000 ft/min. Although this is less than that of some other contemporary fighters, the zoom climb is very impressive.

In its element at high speeds this swept-back fighter easily cruises at Mach numbers appreciably higher than those at which a straight-wing machine would become uncontrollable. At 30,000ft and above, a clean F-86 can comfortably reach Mach 0.9 or better at high cruising power. At this height a certain degree of compressibility can be reached in a shallow dive at an indicated Mach reading of 0.96; however, since the pilot has complete elevator control at all speeds, the slight buffeting encountered causes no concern. In a vertical dive, and at near-sonic speed, either wing will tend to drop until it can no longer be corrected by aileron. At this point, if the pilot has sufficient altitude, he may continue the dive until he breaks through the sound barrier, or pull out normally with or without the use of speed brakes. If supersonic speed is reached it becomes noticeable by a decrease in buffeting and better control. However, most pilots will admit that at this point Mother Earth is rushing up at a somewhat disconcerting speed and one must give full attention to recovering from the dive. As velocity decreases, the buffeting increases and then stops completely at about Mach 0.97.

There is no indication in the cockpit of the controversial "boom" which is associated with supersonic flight, although it is known that this sound—very like an explosion—is heard only in the immediate vicinity of the spot at which the aircraft was pointed in its dive.

Elevator control with the "all-flying tailplane" is completely normal at all speeds. With this type of control the tailplane moves with the elevator in a ratio of roughly 4:1. For example, when the stick is pulled back the tailplane will change its angle of incidence 12 deg., to a 3 deg movement of the elevator, in a combined motion. The majority of aircraft capable of supersonic flight are equipped with this type of control.

The ailerons are extremely sensitive: as an example, it is practically impossible to do one maximum-rate roll, for the machine is almost completely round its roll by the time the stick is moved through its full travel. At very low speeds the lateral control is not so sensitive, although it is satisfactory right up to the stall.

Naturally, with such ease of control the Sabre is a very fine aerobatic airplane. Rolls require no effort other than use of ailerons. Like all fast aircraft, it must be flown around a loop, starting with a 2½-4g pull. In a loop one notices the artificial feel of the controls more than in any other manoeuvre. In other aircraft one generally eases off on stick pressure on top of a loop, but in the Sabre it is necessary to increase stick pressure at the lower speed on top to give the tailplane a greater angle of incidence.

A factor which gives pilots confidence in the machine and banishes a natural reluctance to get into unusual positions in the Sabre is the ejection seat. It is the type found in many other American aircraft in that it does not have the protecting curtain which is pulled over the face, as in the Martin-Baker type. The seat is fired by a trigger on the right side of the seat.

Another feature thoroughly approved of by the pilots is the anti-g suit. This is nothing more than an inflatable girdle, inflated by air drawn from the compressor. It cuts in at approximately 2gs and increases the pilot's tolerance anywhere from 1 to 2½gs. One of its greatest advantages is that it cuts down fatigue. The suit has an inflatable bladder on the stomach, one on either thigh, and one on either calf, and when wearing it the pilot does not have to tense his muscles when pulling g. Indeed, the benefits of the suit are nullified if one's muscles are bunched up.

On rejoining the pattern, speed brakes are generally used to slow down the machine to circuit speed. The pattern and approach are similar to those of most other jet fighters, and the final turn is completed at about 140 kt. It should be brought over the fence at 125 kt and it will touch down smoothly with a very nose-high attitude. The nose can be kept up for deceleration, but, of course, brakes are much more effective if a short run is necessary. The Sabre could be landed in 1,200 yd, but for comfortable operation 2,000 yd are required. Full flap is always used for landing as the float period would otherwise be quite long.

All in all, the F-86 Sabre is a very pleasant and easy airplane to fly and fulfils its operational rôle well. It is admitted, though, that more power is required to increase its effectiveness at high altitudes.

WIT AND WISDOM

—at Boscombe Down's Dinner to the Industry

THE annual "Contractors Dinner" given at Boscombe Down by the Aeroplane and Armament Experimental Establishment was, as briefly mentioned last week, the enjoyable affair which we have come to expect in each of many years. Some of those present—A. and A.E.E. officers, Government officials, manufacturers, test pilots and so forth —are portrayed, gaily if a little unkindly, by cartoonist Fred May on the opposite page.

A. Cdre. A. H. Wheeler, O.B.E. (Air Commodore Commanding), proposing "The Guests," extended a welcome and regretted that accommodation prevented more friends from being invited. He went on to remark that aviation, like other industries, had its worries (to this Sir Frederick Handley Page added a loud "hear hear!"). Fifty years ago manufacturers worried first of all about whether their aircraft would fly, and secondly if they would sell. Now it was a moral certainty that they would fly, and they were usually sold in advance—in spite of what the A. and A.E.E. said. This led him to question the value of Boscombe.

A. Cdre. Wheeler then went on to refer to Boscombe's "new management" and also to the arrival of Colonel Stark of the United States Air Force. The work of the Establishment was pleasant and interesting, but the staff were called upon to be critics, and he recalled Disraeli's dictum that critics were "the men who had failed" in the arts they criticized. At Boscombe there were few who had tried to design and build aircraft. The staff did, however, try to stick to the Air Ministry terms of reference and confine their criticisms to those things which concerned them. The air commodore did not believe that even "the illustrious heads of the industry" could really criticize their own products. If the Boscombe pilots were clumsy and inept, well, it was probable that the aircraft would later get that sort of treatment anyway. There was no doubt that Boscombe had a real duty to do : it represented at least the average of Air Force users. A. Cdre. Wheeler added that the Controllers of Supplies (Air) did not like the wrong answers, and he went on to talk of a certain Captain Bousicault who, being the most stupid officer on Napoleon's staff, was nevertheless most useful in having all orders tried out on him before they were issued.

Sir Frederick Handley Page, C.B.E., began his response by quoting the well-known hymn "The strife is o'er, the battle done, now is the Victor's triumph won." He then went on to refer to the sonic barrier and the shapes of aircraft wings—"some people have gone back to childhood days and imitated the paper dart." More thought should be given to the other end of the speed scale —to going slower at take-off and when landing. Here Sir Frederick recalled the remarkable record of the H.P. Hannibal of pre-war days. He concluded his speech with some entertaining speculations on what might happen were the aircraft industry to be nationalized.

An additional speaker was Sir Harry Garner, K.B.E., C.B., M.A., who is to retire from the post of Chief Scientist, Ministry of Supply, on February 23rd next. He referred to his associations with Air Ministry, Ministry of Aircraft Production and Ministry of Supply, and remarked that he was the only one to have been the head of all three establishments, M.A.E.E., Felixstowe; A.F.E.E., Ringway; and A. and A.E.E., Boscombe. He recalled memories of the first trials of the Mosquito bomber and of a first attempt at a rocket-assisted take-off with a Stirling. He thought that aircraft today were "more exciting." There were "nearly as many shapes as designers of aircraft," and no one could say what the ultimate shape would be. Sir Harry did not agree that piloted aircraft would go out in the next few years : it would be many years before that happened.

Air Marshal Sir John Boothman K.B.E., C.B., D.F.C., Controller of Supplies (Air), M.o.S, proposed "The Aircraft Industry." "What," he asked "is the industry? The two thousand or so firms having A.I.D. approval, or the main aircraft and engine manufacturers?" He would love to see a nationalized aircraft industry if it meant Sir Frederick Handley Page and Sir Roy Dobson sitting as Civil Servants in the same office. He did not think that flying was getting more exciting, and he defined the modern gas turbine as "an infinitely expensive and infinitely complicated blow-lamp." He also described it as having "a point at one end and a hole at the other," surrounded with a mass of bought-out equipment to the cost of which the manufacturers added their 400 per cent. In a more serious vein, Sir John said that the nation owed a debt to the aircraft industry and one that would become increasingly important in the future. Finally, he paid a tribute to Mr. George Edwards, who was to reply to the toast.

Mr. Hugh Burroughes, F.R.Ae.S. (director, Hawker Siddeley Group) told in a brief speech of the great admiration for the way in which Air Marshal Boothman was doing his job—a tough assignment. He recalled the C.S.(A)'s Schneider Cup success, and concluded by adding a further tribute to the work of Mr. George Edwards, Vickers-Armstrong aircraft chief designer.

The final speech, in reply to the toast of "The Aircraft Industry," drew from Mr. Edwards the remark that chief designers were shy, retiring and, by and large, inarticulate. During the last few months the aviation business had taken on a new look. In his opinion, "neither the utmost curvature in place of straight lines nor a job in which you cannot tell the body from the wing is the best"—he believed in the good old British compromise. It might be wondered if some people were building aircraft to fill space in the national Press rather than for the Air Force. Would it not be cheaper just to provide the handouts and save the price of the aircraft—in fact, to replace P.R.U. by P.R.O.?

Turning to the subject of exports, he said that production alone did not sell aircraft; a most intensive and determined sales effort was necessary, and it had to be made clear to potential buyers that what the manufacturer would in fact undertake to do was very different from what his foreign competitors said he would do. The British aircraft industry could make aircraft; some companies could match American production, and in some circumstances, with the right size of order, could do much better.

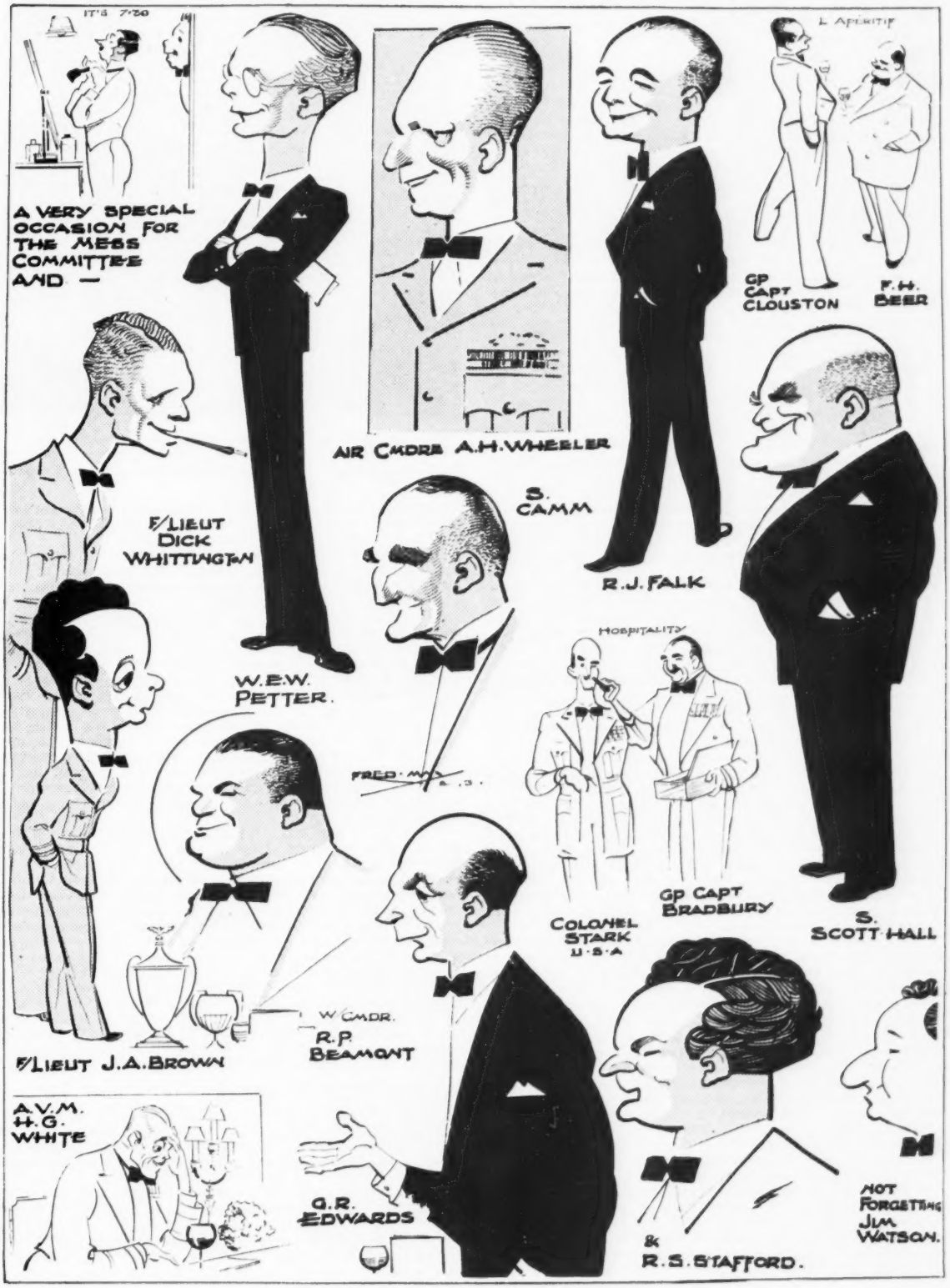
Mr. Edwards went on to say that designers could get nowhere without test pilots to prove the machinery and to do work which was a vital link in the whole process. To get the right answer meant taking risks, and he wished to pay the highest and most sincere tribute to the test pilots. Mr. Edwards also spoke of the work Sir John Boothman was doing, and added that a company must never cut down on development and research. So far as testing was concerned, companies in the industry were growing up and doing more and more to accept responsibility for the testing of their aircraft. They had to fight the temptation to think things were better than they really were. Finally, Mr. Edwards said that British designers hung together, and he was personally proud to take part in this sort of co-operation. It was as it should be.

FORTHCOMING EVENTS

Jan.	30.	Junior Institution of Engineers: "Metal Spinning," by R. R. Baskerville.
Jan.	31.	S.L.A.E. (London): Lecture.
Jan.	31.	Closing date for England-Christchurch (N.Z.) Race Entries.
Feb.	7.	Helicopter Association: Discussion on Standards of Maintenance, and Requirements for Helicopter Engineers' Licences. Papers by Members of the A.R.B. and S.L.A.E.
Feb.	7.	British Interplanetary Society: "Limiting Performance of Rocket Motors," by W. N. Neat, B.A., A.F.R.Ae.S.
Feb.	9.	Institute of Transport: Brancker Memorial Lecture: "The Influence of Military Aviation on Civil Air Transport," by Sir Frederick Handley Page, C.B.E.
Feb.	11.	British Institution of Radio Engineers: "Modern Trends in Communication Materials," by L. A. Thomas, B.Sc., F.Inst.P.
Feb.	11.	R.Ae.S. Graduates' and Students' Section: "Production of Prototype Aircraft," by W. Thorn.
Feb.	12.	R.Ae.S. Section Lecture: "Integral Construction and its Effect on Production Methods," by E. Dixie Keen, B.Sc. (Eng.).
Feb.	14.	British Interplanetary Society (Birmingham): "Rocket Test-bed Instrumentation," by J. Venn, B.Sc.
Feb.	17.	Birmingham and District Aviation Club: Film Show.
Feb.	17.	R.Ae.S. Section Lecture: "Recent Developments in Gliding," by A. H. Yates, B.Sc.(Hons.), A.F.R.Ae.S.
Feb.	18.	Aircraft Recognition Society: Meeting: Guest Speaker, Peter G. Masefield, M.A.(Eng.), F.R.Ae.S.
Feb.	20.	Institute of Navigation: "Navigation and the Operation of Jet Aircraft," by Capt. R. C. Alabaster, D.S.O., D.F.C.
Feb.	21.	British Interplanetary Society (Manchester): "Structural Problems of the Lunar Base," by P. L. Sowerby.
Feb.	24.	R.Ae.S. Graduates' and Students' Section: "Viscount Operations," by Capt. R. Rymer.
Feb.	25.	R.Ae.C.: Britannia Trophy Dinner.
Feb.	26.	Aerodrome Owners' Association: A.G.M. and Annual Dinner.
Feb.	26.	R.Ae.S.: "New Materials and Methods for Aircraft Structure," by H. J. Pollard, Wh. Ex., F.R.Ae.S.
Feb.	27.	A.T.A. Association: Annual Reunion Dinner.
Feb.	28.	S.L.A.E.: "Aircraft Fire-protection Equipment," by R. W. J. Cockram, A.M.I.E.E., A.I.Mech.E.
Mar.	6.	Helicopter Association: Discussion on Flight-testing Experiences: contribution by C. T. D. Hosegood, S/L. W. R. Gellatly and Capt. J. A. Cameron.
Mar.	7.	British Gliding Association: International Contest Victory Ball.

Seen at the A. and A.E.E. Dinner—

SERVICE, CIVILIAN, CIVIL SERVICE



CIVIL AVIATION

BY VISCOUNT TO WAHN

A FELLOW-PASSENGER in the B.E.A. Viscount which flew from London to Cologne and back on January 22nd was Col. R. L. Preston, secretary-general of the Royal Aero Club, who explained before take-off that the flight was not to be a point-to-point record attempt in the normal sense. About two years ago, the F.A.I. instituted new regulations enabling airlines to set up speed records on regular routes. The speed is based on the time between unstick and touch-down, and the usual official observation is not necessary; the pilot simply has to ask the control tower at each terminal to record the exact times of departure and arrival.

Feeling that passengers might be dismayed by the prospect of record-breaking, the airlines have so far not taken advantage of these rules. Fare-paying passengers are not carried on route-proving flights, however, and B.E.A. have decided to set up "transport" records during a series of pre-service flights with the Viscounts during the next few weeks. The flight to Wahn—the terminal for Cologne—established the first of these records; it also enabled Mr. Peter Masefield to open a new B.E.A. office in the city, and to renew acquaintance with executives of the proposed German airline. Unfavourable weather was responsible for the slightly disappointing speeds of just under 283 m.p.h. (outward) and 263 m.p.h., which are certain to be bettered on other flights.

Viscounts are not yet a familiar part of the London Airport scene, and G-ALWE *Discovery*, flagship of the B.E.A. fleet, attracted much attention when the whistling-kettle noise of its Dart turboprops announced its arrival on the apron. The 18 passengers took up vantage-points in the 40-seat cabin, and the crew awaited permission to taxi and take-off. Just before 1400 hr the engines were started; *Discovery* taxied quickly out to Runway No. 2 and was airborne by 1407 hr. Capt. Johnson at once made a steep climbing turn to convert the south-westerly take-off into an eastward climb-on-course. About ten minutes later we levelled off at cruising height (14,000ft), but there was little let-up in the urgent whirr of the four Darts, running at 13,800 r.p.m. and giving a T.A.S. of 330-340 m.p.h. This is 500 r.p.m. faster than the Dart's normal cruising figure, which gives a speed of 291 m.p.h. at 25,000ft (although Darts installed in B.E.A. Dakota freighters have been run for many hours at 13,600 r.p.m., and this speed will probably be confirmed for all Darts).

At 13,800 r.p.m., noise-level in the galley and forward cabin of *Discovery* was higher than one would expect in a machine with such a reputation for smoothness and silence. The extra revs produced a definite buzz around the seats nearest the engines, although near-normal conversation was still possible. Farther back it was much quieter, and the coin-balancing trick could be performed. Just aft of the trailing edge there was evidence of aerodynamic burble beneath one's feet—a cobblestone effect caused by the cabin-blower intake; slight modifications to smooth out airflow are now in hand. But passengers will not be disappointed by the Viscount in regular service. Not only will lower cruising revs be used, but an extra 200 lb of glass-wool insulation is being wrapped round the first 10ft of the cabin interior, further to improve the sound-proofing.

The great-circle distance from London to Wahn is 331.371 statute miles. Peter Masefield had hoped to complete the trip within the hour, but the weather decided otherwise. Word came through *en route* that cloud-base and visibility at Wahn were near the minima, and diversion to Dusseldorf was considered possible. About 50 minutes out of London *Discovery* dipped her nose and, with Darts slightly throttled, headed for the overcast at a true air-speed of 400 m.p.h. The Wahn controllers, accustomed to talking-down Meteor N.F.11s, quickly picked her up over the airport, but the G.C.A. procedure cost a 30-mile diversion from the straight-in approach path originally planned. *Discovery* swept into the circuit and turned on to the ground-guided final approach, breaking cloud at about 300ft above the approach lights. Visibility was little more than 400 yd but, despite the conditions, Capt. Johnson made a perfect touchdown on the greasy runway.

In Cologne, Mr. Masefield formally opened B.E.A.'s attractive new town office, expressing hopes for a steady increase in the frequency of services (at present Wahn is linked to London by daily Viking flights *via* Brussels and to Berlin by a daily Pionair service), and for continued co-operation with the German authorities. Speeches of welcome were made by Herr Adenauer—Mayor of Cologne and son of the Federal German Chancellor—and by Herr Steinmann, commandant of Wahn Airport. Also present was Dr. Bongers, former business manager of Lufthansa and prospective chief executive of the proposed German airline.

"Flight" photograph

A view which will become increasingly familiar to European air travellers: two of the Viscount's four Rolls-Royce Dart turboprops, as seen from the forward starboard window during the record flight to Cologne.

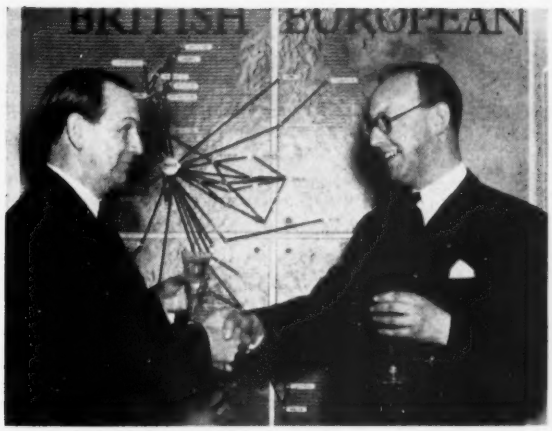
Although most airlines today would welcome the chance of equipping from scratch, one gathered that executives of the future Lufthansa regarded the problem of selecting equipment as a complex and difficult responsibility. It was some encouragement to learn that, despite reports to the contrary, they have not yet definitely accepted offers of Convairs and Constellations and, possibly other American types, and are still weighing the merits of Comets and Viscounts. (At the time of going to press, Professor Heinkel was reported to have put in a strong plea for the purchase of Comets). A Comet is expected to visit Cologne on March 2nd. B.E.A. have offered Vikings as interim equipment for the short-range services, and are also willing to provide crews and training and engineering facilities while the Germany company gets into its stride. This would pave the way for acquisition of Viscounts by about 1955. On the other hand, there is no doubt that there have been tempting American offers, not only of supplying competitive aircraft but of supplying them for German currency.

The return flight, which began at 2150 hr, was made in the face of a 15 kt headwind which reduced the block speed to just below 263 m.p.h. The same cruising power was maintained as on the outward leg, but height was only 12,400ft. Peter Brooks, technical assistant to the chief executive, told us that the Viscount's normal cruising procedure for stage-lengths of around 300 miles would be a steady climb to 25,000ft followed immediately by a gradual descent. The higher r.p.m. and lower altitude used on this occasion to get the best speed performance were responsible for a 20 per cent increase in fuel consumption.

Official times and speeds for the journey, subject to F.A.I. confirmation, were as follows: London-Wahn—1 hr 10 min 17 sec, 282.887 m.p.h.; Wahn-London—1 hr 15 min 41 sec, 262.703 m.p.h. The crew consisted of F/Capt. A. S. Johnson, Capt. S. E. Jones, R/Off. J. Whittaker, Eng. F. Lockwood, Steward T. Cable and Stewardess Pat Lindsay. R.B.

B.C.P.A.'s COMET ORDER

A DEFINITE order for three de Havilland Comet 2s has been placed by British Commonwealth Pacific Airlines. To be delivered towards the end of 1954, they will be used on the trans-Pacific route linking Australia and New Zealand with the North American continent. A further order—for Comet 2s or 3s—is likely; negotiations began in December 1951 on the basis of an order for six Series 2s, but the prospect of the larger, longer-range Series 3 caused the airline to reconsider its plans. B.C.P.A. is owned jointly by the Australian, New Zealand and British Governments, with holdings of, respectively, 50, 30 and 20 per cent.



AT B.E.A.'s COLOGNE OFFICE: Corporation and future Lufthansa executives pictured here are (left) Dr. Bongers with Mr. Peter Masefield, and (right) Capt. J. W. G. James, B.E.A.'s director of flight operations, with Capt. W. Von Engel, who will hold a similar position in Lufthansa.

HUNTING'S YEAR

FIGURES have been published by Hunting Air Transport, Ltd., for the calendar year ended December 31st, 1952. In addition to its main commitments—trooping flights to the Mediterranean and scheduled "Safari" services to East Africa, operated alternately with Airwork, Ltd.—the company's Vikings have flown a large number of charter flights, both occasional and under contract to scheduled operators. Statistics for the year are as follows :—

	Miles Flown	Passengers Carried	Passenger-Miles Flown
Contract Charter (including trooping)	1,841,351	38,515	52,767 903
Regular Operations (including Safari Service to East Africa)	352,398	2,017	10,800,000
Casual Charter	358,163	18,522	11,955,149
	2,551,912	59,054	75,523,052

INDIA-PAKISTAN DISPUTE SETTLED

MEDIATION by I.C.A.O. has brought an amicable settlement of the dispute between India and Pakistan over the question of permitting Indian aircraft to fly a direct route between New Delhi and Kabul, Afghanistan. Agreement has been reached on the opening of two 20-mile wide corridors which Indian civil aircraft will follow from the aerodromes of Lahore and Karachi, both in Pakistani territory, to points in Afghanistan. The corridor on the route between Delhi and Kabul still requires some detour from the direct route, but it permits a much shorter and more direct flight than was previously allowed. The Government of Pakistan has also arranged for the export of sufficient aviation fuel to Afghanistan by overland routes through Pakistan to permit Indian aircraft to refuel there. Previously the lack of fuel in this area forced the Indian operators to carry sufficient fuel for the return as well as the outward journey.

APPLICATIONS APPROVED

APPROVAL of a number of scheduled air services has been announced by the Ministry of Civil Aviation. Details are as follows :—

(1) Normal scheduled services (passenger and supplementary freight) by Air Kruise Ltd., on the routes between Lympne and Le Touquet, Lympe and Ostend *via* Ramsgate, and Ramsgate and Le Touquet *via* Lympne (if required).

(2) The extension to Sao Paulo of B.O.A.C.'s reserved normal scheduled service, London—Lisbon—Casablanca—Dakar—Recife—Rio de Janeiro.

(3) The insertion by B.O.A.C. of a traffic stop at Manila as an alternative to Hong Kong on their reserved normal scheduled service between London and Tokyo.

(4) An extension of Silver City Airways' permit for the carriage of passengers not accompanying vehicles and supplementary freight on their approved vehicle ferry service between Lympne and Le Touquet

BREVITIES

THE Minister of Civil Aviation announces that a public court inquiry will be held into the B.E.A. Viking accident at Belfast on January 5th.

* * *

The Aerodrome Owners Association will hold its 26th annual general meeting at 2.30 p.m. in Londonderry House on February 26th; the annual dinner is to be held on the same day at the Hyde Park Hotel, London, S.W.1 (time, 6.30 for 7 p.m.).

* * *

As reproduced in *Flight* of January 23rd, the message from A. Cdre. Griffith Powell, managing director of Silver City Airways, contained two misprints. In the third paragraph, the word "cars" should be omitted from the sentence beginning "To get a better balance . . ." "Proportion" should be replaced by "propulsion" in the first sentence of the fifth paragraph.

* * *

A report from Australia says the the Department of Civil Aviation is unlikely to proceed with its plan to enforce installation of rearward-facing seats in all new aircraft used on internal services. The statement that "there is a strong public prejudice against the proposal and psychological factor is not good" has been attributed to Mr. Hubert Anthony, Minister of Civil Aviation.

* * *

Despite objections from British Railways, it is expected that the A.T.A.C. will authorize Silver City Airways' application for a vehicle-ferry service between Southampton and Bembridge, Isle of Wight. The runway at Bembridge is being extended to 4,250ft and the service is expected to begin on April 2nd. Bristol Freighters will make the crossing in nine minutes, carrying passengers, cars, cycles and freight. Provisionally fares are quoted as : cars, from £3 2s 6d to £6 17s 6d according to length; motor cycles, 17s 6d; bicycles, 3s; and passengers, 13s 6d.

* * *

In conjunction with the Central Council of Physical Recreation the Ski Club of Great Britain has awarded to Airwork, Ltd., a contract to fly members of a ski-training expedition to Norway. The company's Vikings are operating 14 flights at weekly intervals between Blackbushe and Sola, Stavanger. The return fare of £38 is inclusive of refreshments *en route*, transport, 12 days' board and lodging in Norway, instruction and hire of ski-ing equipment.

* * *

New Zealand National Airways have announced the appointments of Capt. J. J. Busch, as general manager and chief executive officer, and of Mr. D. E. Fowley, as secretary-treasurer and deputy to Capt. Busch. The new general manager, who served with the R.N.Z.A.F. as a group captain during the war, recently completed a three-month visit to the United Kingdom, Holland, Canada and the U.S.A. As operations manager, he took the opportunity during this tour to survey possible DC-3 replacements for N.Z.N.A.C.

* * *

In Hollywood recently, Mr. W. A. Patterson, president of United Air Lines, re-affirmed his forecast that jet airliners would not come into extensive use before 1958 or 1960. He estimated their probable cost at $4,000,000 (£1,428,575) each, and gave the warning that any airline which erred in selecting the right type would face probable bankruptcy. "Our problem is that such aircraft must fly about 1,500 miles non-stop to be economical," said

CIVIL AVIATION . . .

Mr. Patterson, "and as only 13 per cent of our traffic goes over 1,500 miles, we must make the jet applicable to distances shorter than this."

* * *

Air Maroc have placed an order for the attachment of two Palas auxiliary jet units to each of their six S.O. 30P Bretagne Mk Is. By this means the airline hopes to increase the payload of each machine by 2,500 lb for an additional cost of £14,000; the Mk II Bretagne carries 2,200 lb more than the Mk I, being fitted with more powerful post-war Pratt and Whitney R-2800 engines. In this case, however, the difference in price between the standard Mk I and Mk II is now quoted at nearly £30,000.

K.L.M. is reported to have chartered a Skymaster and three crew for a year from the Norwegian independent company Fred Olsen.

* * *

B.O.A.C.'s aircraft flew 859,526,721 passenger-miles, carrying 269,637 passengers, in 1952—an increase of 30,547 passengers over the previous calendar year's result.

* * *

The European summer timetable planned by Swissair contains only one "first-class" service—daily Convair flights in each direction between London and Zurich. The remainder of Swissair's European flights will be tourist services—offering the new standard fares approved at the last I.A.T.A. traffic conference; most will be operated by Convairs or DC-4s.

FROM THE CLUBS

THE newly-formed North Devon Flying Club at Wrafton, near Barnstaple, had its first instructional success since its formation a few weeks ago, when Mr. W. J. Bond, of Barnstaple, was awarded his Private Pilot's Licence.

A COMING-OF-AGE party for the Tiger Moth, which first gained its C. of A. in early March, 1932, is being held by the Vintage Aeroplane Club at Denham airfield at 1130 hr on Saturday, March 7th. All Tiger Moth owners and operators will be welcome, and various competitions are to be held, including inter-club formation flying, individual demonstrations, spot landings, a *concours d'elegance*, and a prize for the oldest Tiger present.

The chairman of the Vintage Aeroplane Club is Capt. R. E. Gillman, D.F.C., D.F.M.; D. F. Ogilvy is secretary, and Major W. L. Foster the treasurer. Later in the season they are arranging a combined meeting with the Vintage Sports Car Club, and David Ogilvy is hoping to attend meetings in the 1929 Miles Martlet G-AAYX—if he can obtain certain spares.

Anyone interested in the Tiger Moth party should write to the Secretary, Vintage Aeroplane Club, c/o Elstree Flying Club, Elstree Aerodrome, Herts.

FROM Cambridge Aero Club we hear that, in 1952, a total of 1,920 hours were flown. A limited quota of night and instrument flying was carried out; seven members gained their Private Pilot's Licences, and 11 more made first solos. Additionally, 24 A.T.C. cadets completed their flying scholarships, thereby qualifying for private licences, and ten more are expected to do likewise within the next few weeks.

MEMBERS of the Surrey Gliding Club have now gained four out of 11 Gold "C" badges held by British glider pilots, and over 50 out of about 400 Silver "C" awards.

The new site at Lasham, situated on a plateau 600ft above sea level, has proved a great success from the soaring point of view; and the club facilities, which include fine workshops, are excellent. The present fleet includes five high-performance sailplanes and one two-seater, and a second two-seater is shortly to be bought.

A 28-YEAR-OLD employee of Auster Aircraft, Ltd., Mrs. R. Pollard, recently became the first woman to learn to fly with the Auster Flying Club. She made her first solo after 13 hours instruction in an Auster J.4 (90 h.p. Cirrus Minor I), taking advantage of the very low rate of 25s hourly which is available to club members. Competitors in the Ragosine-Auster Homing Competition held last May may remember that Mrs. Pollard flew as navigator to Mr. K. Baker of Austers, who came second.

THE annual dance of the Wolverhampton Aero Club was held on December 16th, in appalling weather but with the customary conclusive success. The Ductility Trophy, awarded to the member making most progress during the preceding year, was presented to Mr. Joe Bradley, who had worked his way up to instructor's standard despite an accident, caused by engine failure in a Magister shortly after take-off.

The club's flying affairs are thriving. A total of 60 hours were flown in December by members and A.T.C. cadets, and the Gemini twin-conversion and radio operators' courses appear to be making excellent headway.

SPOTTERS' CHAMPIONSHIP

A RECORD entry of over 80 teams competed in the Sixth All-England Aircraft Recognition Contest, held at the Royal Institution, London, on January 17th. In addition to the usual R.O.C., A.T.C., W.J.A.C., Air Britain and other club entries, teams taking part included those from the Army, Royal Netherlands Air Force, United States Army and A. and A.E.E., Boscombe Down.

As briefly reported in *Flight* on January 23rd, the Silver Hurricane Trophy, presented by the Aircraft Recognition Society to the team with the highest aggregate marks, was won for the second year running by the crack R.O.C. team from Post 19/Y2, Wallington, who scored 85 out of a possible 105. Its three members, Lt/Obs. M. N. Jamieson, Obs. M. J. Hooks and Obs. D. A. R. Pratt, were doubly proud when Obs. Hooks was later again called forward to receive the new *Air Pictorial* Trophy, a handsome cup, for scoring the highest individual marks with 31 correct answers. For the second time the Aircraft Recognition Society's "A" team was second, with 81 points.

The best A.T.C. team was that of No. 305 (Ashford) Kent Squadron who, with a score of 73, were awarded the Silver Heracles Trophy by Sir Frederick Handley Page. No. 4F (Ilford) Squadron, first last time, were second with a total of 68 points.

The Wren Award, a framed caricature by the cartoonist and offered for the best of the Service units competing, was won by a team that had paid its entrance fee scant minutes before the contest began—that from A. and A.E.E.

The test consisted of 35 flying views of present-day aircraft (known to have flown over this country within the last twelve months) flashed on a screen for something less than a second. Most competitors considered the test more difficult than the one given last year; and this view was shared by Mr. Peter Masefield, who admitted that even though he had collaborated with Sir Frederick, the umpire, he could score no more than 17.

E. F. WILD, A.F.C.

THE hundreds of pilots whom he trained, and his many other friends in the flying world, will be saddened by the death of Mr. E. F. Wild, A.F.C., assistant instructor of the Wolverhampton Aero Club. He died on January 11th after three months of illness. A colleague has written the following appreciation :—

" 'Tubby,' as he was affectionately called, was born in 1905; his first association with the R.A.F. was when he joined No. 605 (County of Warwick) Sqn., R. Aux. A.F., in 1930 at Castle Bromwich. He served on ground duties with this squadron until August, 1940, when he re-mustered to pilot and, after a course at C.F.S., was posted as a flying instructor to Desford. He spent a short time there and at Perth before joining No. 28 E.F.T.S. at Wolverhampton. One of his many pupils, A. E. ('Ben') Gunn, is now Boulton Paul's chief test pilot. Before his release in 1945, Tubby Wild was awarded the A.F.C. for meritorious services in the air.

"He joined the Wolverhampton Aero Club in 1946 as an assistant instructor and during the last years had taught many club members to fly, including about six 'works flying-club' members, and A.T.C. cadets on flying scholarships. He had completed some 5,000 hours' flying, 3,050 of them as a Service instructor.

"Known as the 'flying engine driver,' Tubby had been employed by British Railways since leaving school, but his great love for aviation was always to the fore and he spent every moment of his spare time in the air. As an instructor he was without peer, combining all the sympathetic qualities of a good instructor with a flying skill second to none. Although over age for the R.A.F.V.R., he would not rest until he had badgered everyone, from the local commander to the Air Staff, in order to achieve his ambition to remain an active pilot in the V.R. He was allowed to rejoin in 1949, was awarded the rank of master pilot and was serving at the time of his death."

SERVICE AVIATION

Royal Air Force and Naval Aviation News

Canadian Korean Awards

SEVEN members of No. 426 Transport Squadron, R.C.A.F., have received awards for their outstanding work while serving with the Korean airlift. F/L. R. M. Edwards has been awarded the A.F.C., and Cpl. J. P. Trudel the British Empire Medal, while the remainder have received the Queen's Commendation for Valuable Service in the Air: they are F/L. R. E. Burn, F/L. E. R. Wolkowski, F/O. J. P. Wilson, Sgt. G. Howard and Sgt. L. C. Potekal.

F.A.A. Memorial

ON Wednesday, May 20, the Duchess of Kent is to unveil a memorial at Lee-on-Solent, Hants, to the memory of members of the Fleet Air Arm who were killed in the 1939-45 war and who have no known graves. The memorial has been constructed by the Imperial War Graves Commission.

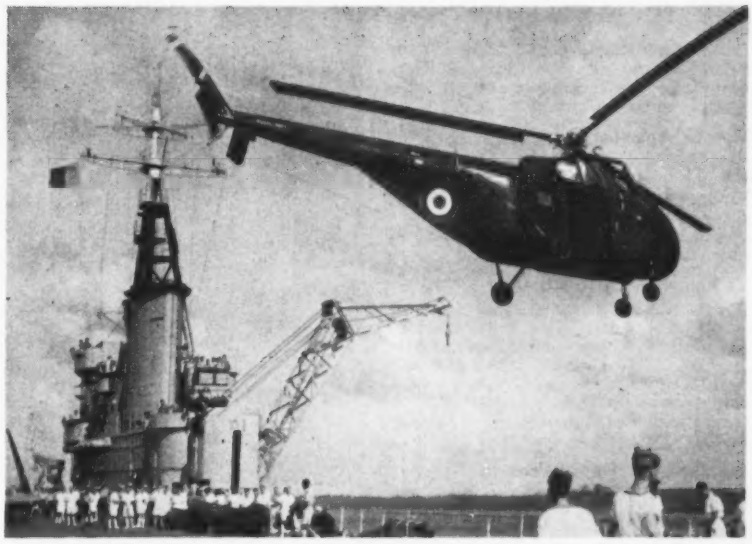
Next-of-kin of those commemorated on the memorial will receive personal invitations to attend.

Lloyd's Trophy and Cup

FOR the fourth year in succession, No. 2502 (Ulster) L.A.A. Squadron, R.Aux.A.F., has won the Lloyd's Trophy for light A.A. gunnery. S/L. F. Shanks, who commands the squadron, has received congratulatory messages from Viscount Brookeborough, Prime Minister of Northern Ireland, who is also Honorary Air Commodore of No. 2502, and from A. Cdre. H. J. G. E. Proud, A.O.C. No. 67 Group.

Lloyd's Cup for rifle shooting, presented by the Committee of Lloyds for annual competition by R.A.F. Regiment squadrons, has been won for the second year in succession by No. 1 (Armoured Car) Squadron, now serving with 2nd A.T.A.F.

It is one of the rules governing the award of the cup that all the men in the squadron, regardless of their trade, must take part; the unit with the best average is the winner.



FOR JUNGLE WARFARE: One of the ten S-55 helicopters leaving the flight deck of H.M.S. "Perseus" on arrival at Singapore. The S-55s are to be used by No. 848 Squadron, R.N., in the jungle warfare in Malaya.

China Sea Incident

WHEN a Neptune patrol bomber of the United States Navy was recently shot down by anti-aircraft fire from the island of Namoa, near the south China coast, five aircraft, including a Sunderland and two Hornets, were sent to the scene from Hong Kong.

After an hour's search the Sunderland reported sighting a life-raft which, with ten men on it, appeared to be drifting toward the coast. A subsequent message from the same flying-boat said that a U.S.N. Mariner had arrived and was trying to alight in order to pick up the survivors. Later still an American troopship received a message to the effect that the Mariner had crashed and submerged while trying to take off with the survivors on board.

The naval base at Langley Point, in the Philippines, reported that ten of the crews of the two aircraft, totalling 21 men, had been rescued and others sighted. There were, however, no further survivors. Two of the Neptune's crew of 13 were killed when it crashed and a further five lost their lives in the rescuing Mariner's unsuccessful take off.

For some years the Chinese have been "trigger happy" when aircraft fly close to the China coastline, but damage to their targets has been rare.

The Seven Wonders

SPEAKING to the assembled company during the recent presentation of wings to National Service pilots at No. 9 Advanced Flying Training School, Wellesbourne Mountford, Warwickshire, Mr. John Profumo, M.P., Parliamentary Secretary to the M.C.A., said that all National Service aircrew would, in future, be trained as fighter pilots. He referred to the aircraft now being given super-priority in production for the R.A.F. as "the seven wonders of the air world."

R.C.A.F. Base in Germany

AN advance party of the Royal Canadian Air Force has arrived at Zweibrücken, Germany, to establish a fighter base there. This will be the third Canadian fighter base to be established abroad. The other two are at North Luffenham, England, and Gros Tenquin, France.

Balliols at Cottesmore

NOW in service at No. 7 F.T.S. at R.A.F. Station, Cottesmore, Rutland, are Boulton Paul Balliols. They replace the Harvards, which have been the standard advanced trainers since just before the war. A photograph of the new trainer appears overleaf.

New D. of S. at Cranwell

THE new Director of Studies at R.A.F. College, Cranwell, is Mr. A. Constant, M.A., who succeeds Mr. P. Johnson.

Mr. Constant, a brother of Mr. Hayne Constant, Director of the National Gas Turbine Establishment, graduated at King's College, Cambridge, in 1939. He specialized in historical geography, and was reading for a research degree when he joined the wartime staff of the Director of Naval Intelligence.

After the war he taught for a time at

HIGH-SPEED PADRE: Inspired by the pictorial feature in our issue of December 12th, this photograph of the Rev. J. R. Payne and his pilot, F/O. L. R. Klaffer, has been sent by No. 78 (F) Wing, R.A.A.F., which is now stationed in Malta. The padre is about to leave in a Meteor 7 to conduct services for the R.A.F. and Australians in North Africa.

SERVICE AVIATION . . .

Oundle and Rugby before becoming, in 1949, Rector of the Royal College, Mauritius, which appointment he has resigned to go to Cranwell.

R.A.F. Appointment

AFTER serving at the Air Ministry for the past two years as Director of Equipment (A), A.V-M. B. E. Essex is going to Maintenance Command as Senior Air Staff Officer. The appointment will take effect from April 1st.

15,000 Korean Sorties

IN the two-and-a-half years during which No. 77 (Fighter) Squadron, R.A.A.F., has served in Korea, it has completed over 15,000 individual sorties, 11,000 of which have been made on the Gloster Meteors that replaced the N.A. Mustangs. No. 77 is now commanded by W/C. J. R. Kinninmont, D.F.C.

Battle of Britain Week

THIS year, Battle of Britain Week will be observed from September 14th to the 20th. As in past years, September 15th is Battle of Britain Day, on which ceremonial parades and the usual fly-past will take place. The R.A.F. "At Home" day, when a selected number of stations will be open to the public, is fixed for Saturday, September 19th.

R.A.F. Half-yearly Promotions

THE following list of officers receiving promotion as from January 1st is in continuation to that published on January 16th, page 83 :—

TECHNICAL BRANCH. *Air Vice-Marshal to Air Marshal*—R. O. Jones, C.B., A.F.C., B.A., D.I.C., M.I.Mech.E., F.R.Ae.S.

Air Commodore to Air Vice-Marshal—R. G. Hart, C.B., C.B.E., M.C., A.M.I.E.E., A.R.C.S., H. W. Heslop, C.B., O.B.E., A.F.R.Ae.S.

Group Captain to Air Commodore.—H. Ford, A.F.C., B.A., T. U .C. Shirley, C.B.E., A.D.C., A.M.I.E.E , A.F.R.Ae.S.

Wing Commander to Group Captain.—A. P. Chamberlain, B.Sc.(Eng.), D.I.C., F. E. Stokes, M.A., A.F.R.Ae.S., E. M. T. Howell, J. E. Kirk, O.B.E.

Squadron Leader to Wing Commander.—L. T. Wright, O.B.E., S. W. Byrne, W. J. Gale, I. E. Hill, L. Wakelin, C. R. C. Howlett, F. E. Ludgate, A. H. Hewitt, L. F. Woolcott, H. F. Davis, S. F. Mitchell, M.B.E., A.F.R.Ae.S., A. C. Nisbet, W. R. Owen, M.B.E., V. F. Wallace, J. T. Main, O.B.E., T. B. Jones, H. H. C. Hester, A.F.R.Ae.S., C. H. C. Down, M.B.E., J. J. Dennis, O.B.E., R. H. C. Sampson, P. W. Nunn, A.F.R.Ae.S., E. J. Watts, M.B.E., A. Murray, P. C. Wright, M.B.E.

Flight Lieutenant to Squadron Leader.—T. de T. MacDonald, R. Duckworth, J. G. Coward, M.B.E., H. C. Flemons, K. H. Wallis, T. U. Dunn, A.F.R.Ae.S., H. Simpson, A. S. Wickins, D.F.C., J. Harvey, G. B. Weston, M.A., P. D. Cherry, D.F.C., D.F.M., A. H. Hope, R. J. Mitchell, M.B.E., A.M.I.E.E., D. D. Thompson, L. A. Marland, H. A. Pook, H. D. Steger-Lewis, W. F. G. Withers, J. C. Dixon, E. N. Beswick, M.B.E., W. Muirhead, A.M.I.Mech.E., R. Los, M.B.E., D. W. Munro, M.B.E., B.E.M., F. W. Evans, R. Tillyard, D. L. Hart, C. F. Whitelock, W. A. Cormack, M.B.E., F. H. Fearnside, C. W. Chesney, M.B.E., H. W. Jarrett, J. F. Humphreys, A.M.I.Mech.E., L. M. Courtenay, T. S. Wilkinson, B. Lock, B.E.M., G. E. Lazzary, T. M. G. Bury, D. R. Levinson, B.E.M., C. Jordan, T. D. Spencer, W. H. Phipps, K. E. Christensen, H. Woolstencroft, D.F.C., H. J. Parker, D.F.M., K. Hellawell, W. C. Hawken, M.B.E., A. Fraser, F. G. Thouard, D. A. Tierney, L. Cottingham, D.F.C., M. F. Hatton, R. J. Franklin, M.B.E., M. G. Bourdaud'hui, E. J. Brimblecombe, F. Roman, M.B.E., L. H. Evans, G. S. Gough, A.M.I.E.E., L. R. Miedzybrodzki, A.F.C. H. G. Jordan, D.S.O., P. M. S. Hedgeland, M.B.E., B.Sc.(Eng.), A.C.G.I., A.M.I.E.E., B. F. Fermor, D.F.C., J. S. Palmer, A. P. Morgan, D.F.C., G. Morgan, G. Satherley, L. J. A. Theobald, R. G. Seymour, T. Taylor, S. M. Davidson, A. P. Harvey, G. L. Quirk, D. G. Dunphy, W. M. Smedley, B. O. Ratcliffe, J. H. Ramsden, G. V. R. Jones, A.F.R.Ae.S., W. Sykes, O.B.E., J. B. Yates, A.F.R.Ae.S., D. K. Kempston, A.F.R.Ae.S., E. Burchmore, M.B.E.

EQUIPMENT BRANCH. *Air Commodore to Air Vice-Marshal.*—B. E. Essex, C.B., C.B.E.

Group Captain to Air Commodore.—M. S. Shapcott.

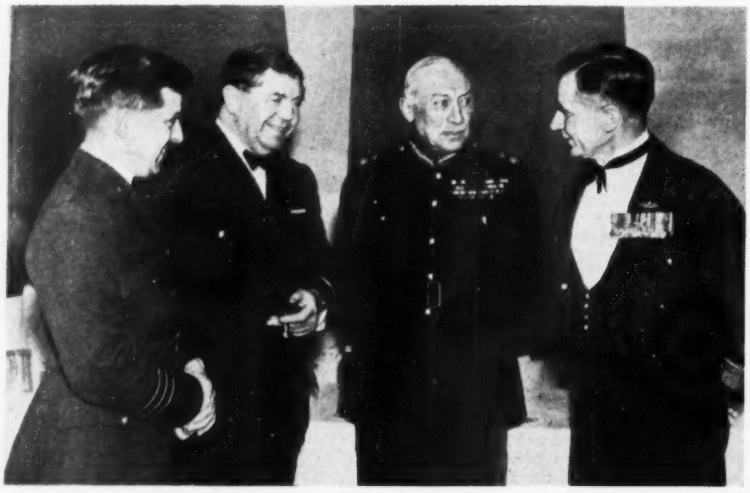
Wing Commander to Group Captain.—K. T. Nicklin, O.B.E.

Squadron Leader to Wing Commander.—R. F. B. Guy, A. W. Heath, A. J. Goatly, O. R. Toyne, M.B.E., E. F. Hales, A. M. R. Ramsden, O.B.E., I. G. H. Drummond, H. C. D. Blasbery.

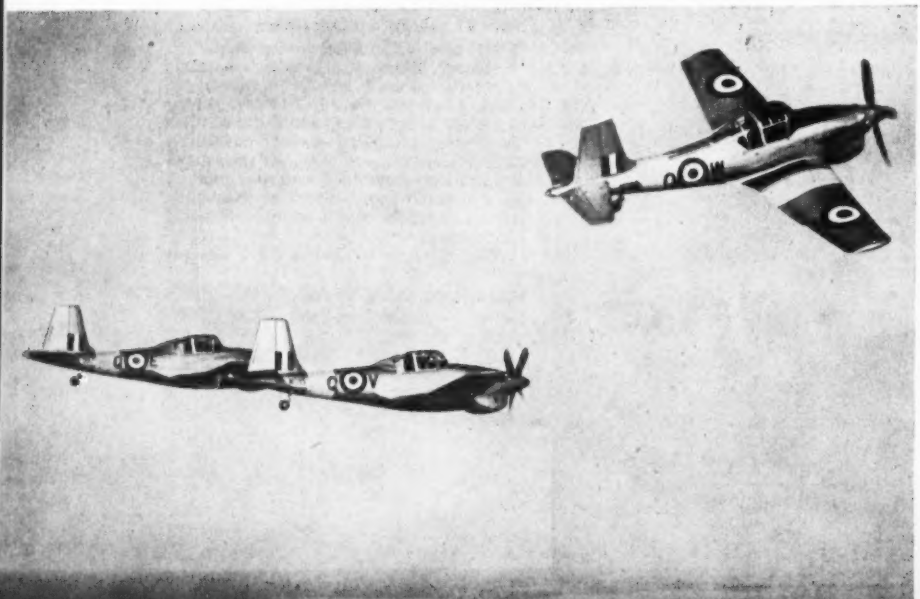
Flight Lieutenant to Squadron Leader.—V. R. D. Borman, R. K. Simmonds, R. C. Hogg, T. J. Partridge, A. F. Betts, A. Childs, J. T. Prentice, W. E. Barrow, C. H. Clarke, J. A. Reddington, G. J. Matthews, C. Murray, C. H. Tamsett, A. G. West, A. J. Dicker, M.B.E., H. J. Ovens, H. F. Whiteman, S. McKeith, R. H. Knight, W. R. Hart, H. Gill, D. G. A. Valentine, J. F. Baker, G. W. Bennington, D.F.M., T. R. I. R. Sanceau.

Flight Officer to Squadron Officer, W.R.A.F.—I. B. West.

(To be continued)



HONOURED GUEST : Air Marshal Sir Basil E. Embry, A.O.C.-in-C. Fighter Command (right), was the principal guest at a dinner held at Sutton-on-Hull to celebrate the appointment of Mr. G. W. Odey, M.P. (second from left), as Hon. Air Commodore of No. 3505 Fighter Control Unit, R.Aux.A.F. The C.O. of the squadron, W/C. A. V. Duffill, is on the left and next to Sir Basil is Col. Lord Middleton, Lord Lieutenant of the East Riding of Yorkshire.



IN SERVICE : Boulton Paul Balliol T.2 trainers (Rolls-Royce Merlin 35) which are now in service at No. 7 Flying Training School, R.A.F. Cottesmore, Rutland.

Reunions

A REUNION of ex-members of No. 458 Squadron, R.A.A.F., is being held in London on February 28. The organizer is Mr. P. W. Pettit, 46 Mecklenbury Square, London, W.C.1.

A second northern reunion of past members of No. 166 Squadron and R.A.F. Station Kirmington is to be held in Manchester on Saturday, February 28th. Particulars from F/L. F. G. Tighe, 31 Mayo Road, Sherwood Rise, Nottingham.

No. 56 Squadron will hold its first reunion dinner since the war at Claridges Hotel on March 4th. Lord Trenchard and Lord Tedder have both accepted invitations to attend. The function is being organized by W/C. G. Maxwell, G/C. H. Dundas and S/L. R. Spooner, the present commanding officer. Members wishing to attend should write to S/L. R. Spooner, R.A.F. Station, Waterbeach, Cambridge.

Nannie knowz best

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17A DRAUGHTSMEN—SENIOR, INTERMEDIATE and JUNIOR for varied aspects of design.

18 MATHEMATICIAN for work on control systems. Knowledge statistics and noise. First-class honours or higher degree.

19 PHYSICISTS—SENIOR—for research team. With honours degree and industrial experience.

20 PHYSICISTS as research workers for field and laboratory tests, with good degree and some industrial experience in electronics or specialising in mathematics.

21 ELECTRONIC ENGINEERS — SENIOR — to be responsible for section engaged in work as reference 22 below.

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The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Failure by the Flying Clubs?

THE article by Capt. R. E. Gillman, "Have the Flying Clubs Failed," in the January 9th issue of *Flight* interested me very greatly, because the policy which he so enthusiastically advocates has been pursued by the Popular Flying Association ever since its foundation as the Ultra Light Aircraft Association in 1946, and the Association's affiliated Groups have amply proved the possibilities of such schemes. Experience has shown that normal light aircraft can be operated at less than £2 per hour.

There are, however, one or two points that the article raises which are worthy of closer attention. The first is the misapprehension that qualified instructors are readily available to give their services just for the sake of flying. Unfortunately this is not the case, and one of the biggest problems facing the Groups today is this shortage of suitable instructors; and if Capt. Gillman knows of any of these paragons he mentions I shall be delighted to hear from him.

Secondly, whilst the resuscitating of old aircraft is a fascinating and educational hobby it is not always the quickest and cheapest way of getting a group of enthusiasts airborne. Serviceable second-hand light aircraft can be bought cheaply today and finance on attractive terms is available, as many of our Groups can tell.

Thirdly, the properly constituted co-ownership group does qualify for petrol tax rebate, and Groups have participated in the scheme since its inception.

Fourthly, there are considerable concessions in respect of maintenance to "public transport" standards which have been granted to Groups by the Minister of Civil Aviation and which greatly help toward easier and cheaper maintenance and operation.

One of the Association's Groups has now completed over 1,000 hours' flying, mostly in the last two years, has had twelve Private Pilot's Licences granted to members and has another batch of six almost completely trained, all at under £2 per hour. Other Groups can show records almost as good.

With Capt. Gillman, we believe in getting on with the job instead of moaning and waiting for a "hand-out," and we shall be delighted to show other enthusiasts exactly how it is done.

London, W.1. MAURICE O. IMRAY.
Secretary, Popular Flying Association.

THE article by Capt. R. E. Gillman on the flying clubs *should* raise a number of eyebrows and, I hope, spur a few people into action, but I doubt whether it will do the latter. As he says, there is complete lethargy throughout the club and private flying movement and it is difficult to arouse any genuinely active enthusiasm.

Even in the Vintage Aeroplane Club, which draws its members from the entire country, the number of entries for any competitive events never amount to two figures. Also, from a membership of very nearly two hundred, it is a difficult task to form an active committee of eight! This, too, in an organization that is essentially an association of enthusiasts and in no way a normal flying club.

As for advanced flying instruction being made available at clubs, this is most certainly to be encouraged, but the average member aspires to nothing greater than the ability to potter about the right way up, take the girl-friend for a trip and occasionally land at another airfield.

However, this is not to say that a further interest cannot be instilled into some pupils, and an effort should be made to feed these interested parties with the appropriate fodder right from the start. This creates a completely different attitude towards this flying game, and an introduction to spirited handling at an early stage must make its mark for the remainder of that member's flying days.

I am not trying to imply that each club pupil can or should be made into a budding fighter pilot, but if a member learns something of an aeroplane's capabilities and realizes that stoogeing round in the local area is not necessarily the be-all and end-all of the sport, he becomes interested in more advanced activities. With this in mind we make a habit here of introducing the feeling of inverted flight and unusual positions as soon as a pupil is happy enough to try it. At the end of each Sunday's activities I ask who would like fifteen minutes aerobatics in a Magister and it inevitably leads to the tossing of a coin to decide who should go—and many of the willing customers are people who have not yet flown solo.

This, I hope, will lead to such pupils having greater ambitions for themselves at later stages in their training; but, in the meantime, if any otherwise-qualified pilots are anxious to learn either formation flying or aerobatics, we are more than pleased to accommodate them. DAVID F. OGILVY,

Elstree, Herts. C.F.I., Elstree Flying Club.

The Hook Hydrofin in America (see letter below).

Hydro-skis and Hydrofin

I WAS interested to read the article about hydro-skis in *Flight* of December 5th, and I note that you mention the Hook Hydrofin, albeit somewhat in the past tense.

It seems to me that your readers would be interested in knowing that the Hydrofin was never designed or intended for use on aircraft which take off from protected waters where incidence control of the foils is not required; also, that the Hydrofin is very much alive and very active in the States.

It would appear that the respective spheres of usefulness of the hydrofoil and the hydro-ski are now becoming clear:—

Hydro-ski.—Low efficiency (worse than a planing bottom) but convenient for aircraft on protected waters, because easily retracted into the hull. Allows a good aerodynamic hull to be used on a marine aircraft.

Hydrofoil.—High efficiency (better than planing bottom); can supply constant lift over rough water, thus eliminating all bumps if the incidence is suitably controlled either manually or by predictor with powerful damping.

Although complete retraction is now provided it is admittedly more complex for the hydrofoil with prediction gear since air drive was ruled out. To compensate for this the passage over a rough sea that would give 6-8 g in a planing hull is accomplished on hydrofoils with ½ g only, so that the perfect cross-channel dash is just around the corner.

Miami, Florida. CHRISTOPHER HOOK,
Atlantic Hydrofin Corporation.

Approach Obstructions

IT would appear from B.E.A's report on the Viking accident at Nutt's Corner that the primary cause of loss of life and injury was the disintegration of the aircraft after striking a building on the approach path—presumably close to the airfield.

In view of the fact that, in emergency, an aircraft might be obliged to approach below the glide path, why are such obstructions allowed to be built, or to remain?

Every time I come past the east end of London Airport I wonder to myself what chance a crippled aircraft would have on the fantastic "griddle irons" which exist there to support the approach lights, let alone the very substantial brick building which also exists on the approach path actually within the airfield boundary.

Surely the lights could be sited on either side of the path, as on some Service airfields in this country, and the building removed?

Apart from this aspect of this unfortunate accident I feel that thanks are due to Mr. Peter Masefield for his initial report which followed soon after the occurrence.

London, S.E.19. H. CLIFFORD BARSON.

Reproof—in Rhyme

ALTHOUGH I do not normally
Find cause to write to you so formally,
I must object when Admiral Slattery
Is subject to such blatant Flattery.
It might be taken as a slight
From any other source than *Flight*.

Belfast. D. KEITH-LUCAS.

[In a recent paragraph an "F" exchanged itself with an "S": our apologies to Short Brothers' chairman—and congratulations to their Mr. Keith-Lucas on his poetic talents.—ED.]

THE INDUSTRY

Rolls-Royce Re-organization

CONTINUOUS expansion of foreign business has caused Rolls-Royce, Ltd., to re-organize and strengthen its aircraft-engine sales side. As announced in our pages last August, Air Marshal Sir Colin W. Weedon, K.B.E., C.B., has joined the company; as export sales manager, he now assumes control of all business coming under the heading of export sales promotion and market research. On his staff at Derby he will have G/C. L. R. Stokes, D.F.C., S/L. J. E. Brown, D.F.C., and S/L. F. M. G. Scotter, D.F.C.

Sir Colin's department will also be responsible for appointing overseas agents. Now coming under its control are the agencies for Australasia (Mr. Peter Birch, Melbourne), the Benelux countries (Mr. H. Millward, Amsterdam) and North America (A. Cdre. E. R. Pearce, stationed at Rolls-Royce of Canada, Ltd.).

The technical sales and services group, with Mr. F. T. Hinkley as its general manager, will control the following departments :—

Aero Service (Mr. W. P. Calvert).—Responsible for the servicing of Rolls-Royce aircraft engines throughout the world.

Technical Services (Mr. D. J. Kay, taking over from Mr. A. Harvey-Bailey, who is shortly to become manager of a new Rolls-Royce repair base in Australia).—Deals with all technical aspects of servicing, such as repair engineering, failure investigation and spares assessment.

Commercial Contracts.—Remains under the management of Mr. D. S. Burns, with Mr. E. J. Towlson as his deputy.

Licence Office.—Comes under Mr. J. P. Herriot as engineer-in-charge.

The technical services sections in the Glasgow factories are also part of the technical sales and services group. The chief technical executive of the group will be Mr. C. R. Creighton, who will be known as chief technical services engineer.

Painting Aluminium

IN 1947 the Aluminium Development Association published a booklet (No. 13) on the surface finishing of light alloys. Such progress has been made since that date in the painting of aluminium surfaces that a further booklet (No. 20) has now been published, referring only to this branch of the subject.

Information is given on various methods of cleaning and degreasing, followed by details of the pre-treatment required to give a satisfactory surface for paint reception. Methods include chromate and phosphoric-acid baths, swabbing of larger surfaces, and the use of a new "etch" primer, which is a vinyl resin base containing zinc tetroxychromate or chromate.

Finally, the possible choice of paint systems is outlined: single-coatings are claimed satisfactory for decorative and general protective purposes, but as many as three or four, including a primer, may be required for surfaces that have to withstand attack from the weather or severe industrial conditions. It is stated that paint-surface lasts unusually well on properly prepared aluminium, and that corrosion does not spread appreciably around an injury. Repainting is also discussed.

The booklet may be obtained from A.D.A. at 33 Grosvenor Street, London, W.1.

JUBILEE CELEBRATION: Caught by the camera at the H. M. Hobson "50-year" dinner at Wolverhampton: Mr. E. A. H. de Poorter (left), who was one of the original three partners in the firm, and Mr. S. A. Davis, Regional Controller, M.o.S. A report on the dinner appeared in our pages last week.

Silicone Rubber

AN informative booklet recently produced by the Dunlop Rubber Co., Ltd., explains the properties and limitations of silicone rubber. Natural and synthetic rubbers are essentially hydrocarbons—substances in which the molecules are composed of long chains of carbon atoms. The chains in silicone rubber are made up of alternate silicon and oxygen atoms, and the energy required to break a bond between two such atoms is greater than that required to disrupt a carbon-carbon bond.

From these facts arise the surprising and useful properties of the product. Different grades of material can be made by variations in the manufacturing process, but the outstanding characteristic of them all is the retention of strength, shape and elasticity over a very wide range of temperatures. Thus an ordinary rubber loses most of its flexibility if subjected to a temperature of 300 deg F even for as short a period as 24 hours, while at the other end of the scale it becomes brittle at temperatures of the order of −25 deg F. It is stated that silicone rubbers are available which will satisfactorily withstand prolonged exposure to temperatures ranging from 350 deg F to −130 deg F, and can undergo occasional heating to 500 deg F without harm.

The properties of these materials may not necessarily be better than those of natural rubber at room temperature—frequently they are not; the point is that they retain their properties largely unimpaired under conditions which would cause rapid deterioration of natural rubber. Silicone rubbers have good electrical insulating properties, are chemically resistant to hot oil, and withstand the ageing action of water, ultra-violet light and oxydizing agents unusually well.

A limited supply of the booklets is available, and executives may obtain copies on application to Dunlop's General Rubber Goods Division, Cambridge Street, Manchester.

IN BRIEF

AFTER more than 50 years in their premises at Victoria Street, London, the British Standards Institution is to move into new offices at 2 Park Street, W.1, at the end of the summer.

* * *

The new address of Kenton Equipment, Ltd., world distributors of "B.O.A.C. hydrostatic weighing units" is 708 Kenton Road, Kenton, Harrow, Middlesex (Wordsworth 7805).

* * *

Three leaflets (FD5, FD10 and FD14) produced by the Morgan Crucible Co., Ltd., of Battersea Church Road, London, S.W.11, give details of their lift-out, tilting and bale-out crucible furnaces.

* * *

Production of British gas turbines under licence to American manufacturers is bringing the firm of Joseph Lucas, Ltd., £100,000 a year in royalties on patented components. This was disclosed by Mr. A. B. Waring, chairman of the company, in a recent speech made as president of the Birmingham Chamber of Commerce.

* * *

The first of a series of ten weekly lectures on gas-turbine technology was delivered on January 21st at the South-East London Technical College by Mr. R. C. Orford, M.Sc., C.P.A., A.M.I.E.E., patents manager of Power Jets (Research and Development), Ltd. Subjects covered in the series include a historical survey, types of open and closed cycles and compound cycles, intercooling, reheat, industrial and surface-transport applications, and a review of the design and manufacture of components.

* * *

On January 20th, A. V-M. H. N. Thornton, C.B.E., sales director of Blackburn and General Aircraft, Ltd., sailed for India on the first leg of a tour which is to cover India, Thailand, Australia and Japan. The purpose of the tour is to expedite overseas sales of the Universal Freighter and Cirrus and Turboméca engines.

* * *

Four Froude dynamometers have been dispatched to A. V. Roe (Canada), Ltd., by Heenan and Froude, Ltd., of Worcester, for use in gas-turbine testing. The machines are capable of running at relatively high powers and speeds, thus facilitating the testing of accessory drives, and their hydraulic weighing gear enables power readings to be taken inside a soundproof control cabin situated some distance from the test-bed.

* * *

The directors of Metalastik, Ltd., announce that a long-term manufacturing agreement has been concluded with a leading French concern to produce products under that trade mark for France and the French territories. This agreement provides for close technical and commercial collaboration between the companies, and orders are being placed in this country for the special-purpose equipment required.

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY — *Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Situations Vacant. The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc. if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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MESSENGER, Gipsy 1D (engine and airframe 330 hours). Yellow, with red leather upholstery, head rests, etc. C. of A. to end of November, 1953. Perfect aeroplane. Price £920.—Box 4903. [9179

Q.6 The only 5,500 lb A.V.W. version available. C. of A. expires Feb. 26th, 1953. Low engine and airframe hours. Offers.—Ductile Steels Ltd., Willenhall, Staffs. Tel.: Willenhall 467. [9196

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£5 A.R.G. 1 for astro sight reduction. With instructions.—I. Davies, 126, Stockwell Rd., S.W.9. (BRI 5114). [9181

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VENDAIR, Croydon Airport, offer British and American aeronautical spares and ancillary equipment for sale from stock. All inquiries to Vendair, Sales Dept., Terminal Building, Croydon Airport, Croydon 5777. [0000

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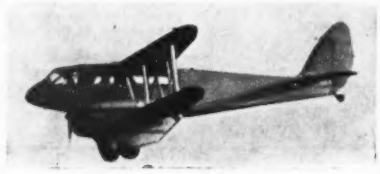

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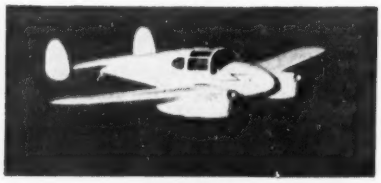

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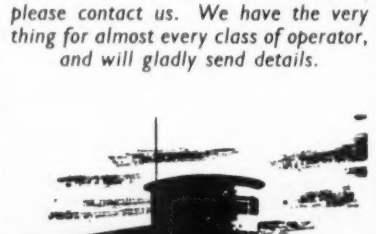

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 143 from Derby Aviation, Ltd., of Municipal Airport, Burnaston, nr. Derby, for a U.K. Internal Seasonal service initially with DH.89 aircraft for the carriage of passengers, supplementary freight and mail between Derby Airport and Jersey, with an intermediate traffic stop at Wolverhampton, at a frequency of one service on Saturday and Sunday during the period from May 1st, 1953, to September 30th, 1960.

APPLICATION No. 144 from Patrick Aviation Ltd., of 479, Bristol Road, Birmingham 29, for a Normal Scheduled service with DH.89 and Dakota aircraft, for the carriage of passengers, supplementary freight and mail between Birmingham (Elmdon) and Amsterdam (Schipol), at an initial frequency of three services weekly up to one service daily, during the period from May 1st, 1953 to April 30th, 1960.

APPLICATION No. 145 from Air Navigation and Trading Co., Ltd., of Blackpool Airport, Blackpool, for a U.K. Internal service initially with DH.89a and Avro Anson aircraft and later with DH. Drover aircraft for the carriage of passengers, supplementary freight and mail, between Blackpool (Squires Gate) and Isle of Man (Ronaldsway) at a frequency of up to three services weekly during the period from May 31st, 1953, to May 30th, 1960.

APPLICATION No. 146 from Starways, Ltd., of Speke Airport, Liverpool 19, for a Seasonal Inclusive Tour service with Dakota aircraft for the carriage of passengers and supplementary freight between London (Bovingdon or Blackbushe) and Tarbes, at a frequency of from one to five services weekly, during the period from May 1st, 1953, to October 31st, 1957.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [9197

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AVAILABLE: BC375, BC624, BC342, SCR695A, TR1143A, TR1133, T1131, power units types 16 and 15, control units No. 3, etc.—E.W.S. Co., 69, Church Rd., Moseley, Birmingham. [9187

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"THE AERODYNAMICS OF THE HELICOPTER"
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THE Course will deal with the basic aerodynamics and performance of rotating wing aircraft, including discussions on problems of stability and control.

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AIR SERVICE TRAINING OF HAMBLE provides training in all branches of aviation in their flying, navigation, radio and engineering schools.

DETAILS of the numerous "ab initio" and conversion courses available will be forwarded on application to the Commandant, Air Service Training, Ltd., Hamble, Southampton. [0570

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

CENTRAL AFRICAN AIRWAYS CORPORATION.

THE Board of Central African Airways Corporation invites written applications for the post of GENERAL MANAGER.

THE Corporation, with its Head Office at Salisbury, Southern Rhodesia, operates scheduled passenger, mail and freight services between Central Africa and Johannesburg and Nairobi, as well as internal and feeder services in Southern Rhodesia, Northern Rhodesia and Nyasaland, and in addition has applied for a licence to operate a "coach" service between Salisbury and London.

THE aircraft use in are Vikings and Beavers, over a route mileage in Africa of 7,885. The average number of passengers carried monthly in the year ended November 30th, 1952, was 7,729 and the hours flown for the same 12 months amounted to 20,695.

CONDITIONS OF SERVICE: The present principal conditions are:—

(a) EMOLUMENTS: Salary scale £2,400 per annum, rising by annual increments of £100 to £2,800 per annum.

(b) LEAVE: Per year of service and in accordance with the provisions of the Corporation's standard conditions of employment, vacation leave (cumulative) at a rate equivalent to 36 days per annum, and occasional leave (non-cumulative) six days per annum. In addition, sick leave on full pay up to 21 days in the first year, 42 days in the second year, and 90 days in the third and subsequent years of service.

(c) TRAVEL: Certain travel privileges are accorded to the official and his family in accordance with regulations in force from time to time.

(d) TERMINATION OF SERVICE: Three months' notice on either side within the first two years of service, and thereafter six months.

(e) MEMBERSHIP of the Corporations' pension scheme will be compulsory.

APPLICANTS should state:—

(a) FULL name and address.

(b) AGE next birthday, and place of birth.

(c) NATIONALITY at birth and present nationality

(d) MARITAL state and number of dependent children, if any.

(e) PARTICULARS of service in H.M. Forces, if any.

(f) EDUCATIONAL details.

(g) DETAILS of career to date, including experience in any air force or civil aviation undertaking, and licences held, if any.

(h) PRESENT employment and name and address of employer.

(i) LENGTH of notice required to commence duties.

(j) NAMES and addresses of persons to whom reference can be made.

NOTE: If desired, written references can be forwarded, but these must be copies only, as responsibility cannot be accepted for originals.

APPLICATIONS should be addressed to the Chairman, Central African Airways Corporation, P.O. Box 1979, Salisbury, Southern Rhodesia, so as to arrive not later than February 15th, 1953. Envelopes must be endorsed G.M.APP. in the bottom left-hand corner.

December 29th., 1952. [9145

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section), have vacancies at their Hurn Depot (nr. Bournemouth, Hants.) for the following staff:—

DESIGN DRAUGHTSMEN
(aircraft experience preferable but not essential)
AIRCRAFT STRESSMEN
SENIOR AND JUNIOR WEIGHTS ENGINEERS
(for aircraft work in design office)

APPLY, in writing, to the Employment Manager, Vickers-Armstrongs Ltd. (Aircraft Section), Weybridge, Surrey.

APPLICATIONS, with certain exceptions are subject to the approval of the Ministry of Labour and National Service. [9186

AIRCRAFT manufacturing firm on south coast, with progressive policy, require the following labour for super-priority production work:—

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SENIOR and intermediate design draughtsmen, with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply by letter to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [9078

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The age limits are between 16¼ and 17¼ years on August 31st, 1953, but applicants offering G.C.E. at the Advanced level with Mathematics, Physics and Chemistry will be considered above 17¼ years of age.

Apply, giving full particulars, before 31st March, 1953, quoting "F" to

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SITUATIONS VACANT

APPLICATIONS are invited for the following posts:—

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ELECTRICAL ENGINEER
ELECTRONIC ENGINEER
DEVELOPMENT ENGINEER
TECHNICAL ILLUSTRATOR

in connection with interesting work on aircraft air conditioning and pressurisation and other projects.—Apply Personnel Officer, Sir George Godfrey and Partners, Ltd., Hampton Road West, Hanworth, Middlesex. [9202

AIRCRAFT manufacturing firm on south coast, with progressive policy, engaged on super-priority production, has a number of vacancies for the following:—

SENIOR DESIGN DRAUGHTSMEN
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GOOD working conditions. General welfare services and assistance with regard to housing or accommodation when possible. Modern canteen facilities.
APPLY, in writing, stating experience, etc., to Box 4901. [9177

PILOTS.

WEST AFRICAN AIRWAYS CORPORATION have vacancies for pilots to be appointed as junior captains and invite applications from pilots who hold a current Airline Transport Pilot's Licence. West African Airways Corporation have an expanding fleet of Marathon, Dove and Wayfarer aircraft.
SALARY according to qualifications and experience within the range of £1,660 per annum and £1,960 per annum.
FREE fully furnished accommodation is provided in West Africa, but married men on initial engagement may be required to serve for a few months before being joined by their families.
FREE return passages are provided each tour for the employee, his wife and up to two children not exceeding 18 years of age.
TOURS of duty will be from 12 to 15 months with leave on full salary at the rate of one-fifth of the period of service in West Africa.
CONDITIONS of service will include membership of a pension scheme allowing retirement at 45, subject to a minimum of 10 years' service. (Retirement five years earlier may be arranged by mutual agreement.) In the case of employees not completing 10 years' service, a gratuity arrangement exists whereby, subject to a minimum of four years' service, a payment at the rate of £150 for each full year of service will be made on termination of appointment.
A COMPREHENSIVE contributory medical scheme exists for employees and their families.
APPLICATIONS should be submitted to the local Agents of W.A.A.C., B.O.A.C., Airways House (Room 105), Great West Road, Brentford, Middlesex. [0740

RADIO OFFICERS.

WEST AFRICAN AIRWAYS CORPORATION have vacancies for radio officers. Essential qualifications include possession of current M.C.A. 1st class flight radio telegraphy operator's licence.
SALARY according to qualifications and experience within the range of £1,100 per annum to £1,300 per annum (all-in).
IN lieu of benefits from a pension scheme, radio officers receive a bonus of £37/10/- for each completed three months of service.
FREE fully furnished accommodation is provided in West Africa, but married men on initial engagement may be required to serve for a few months before being joined by their families.
FREE return passages are provided each tour for the employee, his wife, and up to two children, not exceeding 18 years of age.
TOURS of duty will be from 12 to 15 months with leave on full salary at the rate of one-fifth of the period of service in West Africa.
APPLICATIONS should be submitted to the Local Agents of W.A.A.C., British Overseas Airways Corporation, Airways House (Room 105), Great West Road, Brentford, Middlesex. [0741

SILVER CITY AIRWAYS, Ltd.

VACANCY exists in fully approved workshop for A and/or B licensed radio engineer. Applications for interview, all expenses will be paid, to Manager, Blackbushe Airport, Camberley. [9090

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THE COLLEGE OF AERONAUTICS

RESEARCH assistant required in the Department of Flight. Applicants should possess a degree in engineering, physics or mathematics, or, alternatively, Higher National Certificate plus good practical training. Previous experience of flight research not essential, but applicants must be willing and fit to fly. Salary, depending upon qualifications, within the range of £900 to £500 per annum. Hostel accommodation available. Applications, giving full particulars and containing the names and addresses of not more than three referees, to the Registrar, The College of Aeronautics, Cranfield, Bletchley, Bucks. Closing date, February 20th, 1953. [9196

TECHNICAL publications department of well-known aero engine firm requires:—
TECHNICAL authors, able to initiate, visualize, write and supervise completion of sales brochures and instructional literature on technical subjects. I.C., electrical or aircraft engineering training and previous experience essential.
TECHNICAL artists, able to prepare sectioned perspective drawings from blueprints, and preferably also work them up for half-tone reproduction. Only fully competent artists required.
LAYOUT artists, able to design, and specify in detail for printing, layouts for completion and manuals. Accurate casting off essential.
GOOD salary to suitable applicants. Pension scheme. Sports ground and social club.—Please reply, quoting Ref. DIE, to Box 4939. [9193

COMMERCIAL pilot (Auster) required. Pleasure flying and charter. Seaside resort. June-September.—Box 4906. [9188

WESTLAND AIRCRAFT, Ltd., Yeovil, Somerset, require stressmen, junior and intermediate draughtsmen and technical writer.—Applications, stating age, experience and salary required, should be addressed to Personnel Officer. [9112

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SENIOR mechanical draughtsman required with some aircraft and/or sheet metal experience. H.N.C. Standard. Good salary and conditions, bonus and pension scheme with canteen and social club.

APPLY: Redwing, Ltd., 340, Bensham Lane, Thornton Heath. [9154

AIR MINISTRY. Ex-R.A.F. officers for technical posts. The Civil Service Commissioners invite applications from ex-R.A.F. officers for the following pensionable posts:—

(a) FIVE technical superintendents (signals).

(b) THREE assistant technical superintendents (electrical).

(c) TWO assistant technical superintendents (armament).

ALL posts in provinces. Age at least 27 on January 1st, 1953. Qualifications: minimum of five years as officer in tech. branch, R.A.F. or, if non-tech. officer, H.N.C.—electrical and/or mechanical engineering or equivalent (R.A.F. technical apprenticeship acceptable) and five years industrial experience in responsible position.

INCLUSIVE salary: (a) £623 (at age 27) to £849; (b) and (c) £528 (at age 27) to £702, with promotion prospects. HIGHER starting salary up to age 30 or over on entry.

FURTHER details and application forms from Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting S4180/53. Applications to be returned by February 26th, 1953. [9185

TRANSAIR, Ltd., require for their base at Croydon licensed and unlicensed engineers for Dakota aircraft. —Apply: Transair Ltd., Croydon Airport, Surrey. Tel.: CROydon 7488. [9199

FOLLAND AIRCRAFT, Ltd., require senior and junior draughtsmen for an interesting programme of aircraft work. Applications to the Personnel Manager, Folland Aircraft, Limited, Hamble, Hants. [9130

SKYWAYS, Ltd., are extending their York fleet and require additional navigating and second officers with appropriate M.C.A. licences.—Applications to the Personnel Manager, 6-7, Berkeley Street, London, W.1. [9280

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex. Apply by letter or telephone to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 54491. [9050

VACANCIES exist for draughtsmen and stressmen possessing keenness and initiative.—Applications, giving full details, to Personnel Supervisor, Hawker Aircraft Ltd., Canbury Park Road, Kingston-on-Thames. [9159

AIRCRAFT and mechanical draughtsmen required. Senior and intermediate grades. Applications detailing experience, qualifications and salary required, to the Chief Draughtsman, Graviner Colnbrook, Foyle Mill, Colnbrook, Bucks. [9142

SENIOR stressmen required in established south of England aircraft design office. Mechanical and/or engine experience, in addition to aircraft structures an advantage. Men capable of taking entire responsibility for complete components needed.

WRITE, giving full particulars, to Box 4898. [9174

TECHNICAL illustrator required, aged 23 or over, with considerable practical experience.—Applications in writing to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [9593

APPLICATIONS invited for designing draughtsmen, structures and electrical, also draughtsmen for modification leaflets, trial installations, etc.—Applications to Chief Draughtsman, the de Havilland Aircraft Co., Ltd., Airspeed Division, Christchurch, Hants. [9125

GLOSTER AIRCRAFT Co., Ltd., have vacancies for aircraft design draughtsmen and electrical draughtsmen.—Write, giving full details of previous experience, age and salary required, to Employment Officer, G.A.C., Ltd., Hucclecote, Glos. [0910

JIG and tool draughtsmen, fully experienced, required by Percival Aircraft, Ltd., Luton Airport, Beds. Good working conditions and full welfare facilities, including staff pension scheme.—Applications to the Personnel Manager, stating age, experience, salary required. [0600

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

OPPORTUNITIES are offered to experienced draughtsmen and designers in the aero gas turbine field to deal with: Blade design, engine design, fuel and control systems and weight control. The positions arise in a progressive company in the London area and they are permanent and pensionable.—Write, with full particulars and Ref. ACJ. to Box 4957. [9201

APPLICATIONS are invited from experienced engineers for the post of chief works inspector at established aircraft company in south of England.—All applications will be treated in strictest confidence and full details regarding age, qualifications and salary required must be given to Box 4899. [9175

ARMSTRONG SIDDELEY MOTORS have vacancies for two designers in their rocket design office. Age 23-30. With H.N.C. or higher qualifications. Airframe or engine experience advantageous. Capable men have excellent opportunities.—Reply to Reference SA5, Personnel Manager, Armstrong Siddeley Motors, Coventry. [9143

APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aero-engine design desirable, but not essential. Also checkers. —Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0930

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities including staff pension scheme.—Applications, stating qualifications, experience, age and salary required, to Personnel Manager. [0596

SENIOR design draughtsman with good technical background required for interesting work on power operated flying controls. Must be fully experienced in precision mechanical engineering, and capable of carrying out complete designs. Knowledge of hydraulics necessary. Excellent prospects of advancement. Pension scheme. Full details in writing of experience, etc., to the Personnel Manager, The Fairey Aviation Co. Ltd., Hayes, Middx. [9146

REQUIRED immediately by Percival Aircraft, Ltd., Luton Airport, Beds, several draughtsmen with comprehensive experience of engine installations and allied systems. Good welfare facilities, including staff pension scheme.—Applications, in writing, stating age, qualifications, experience and salary required, to the Personnel Manager. [0601

ELECTRONIC engineer required for turbine laboratory. Should possess a degree in electrical engineering and previous laboratory experience in physics, electrical engineering or instrument technology would be an advantage. (Situation S.W. Middlesex.)—Send details of qualifications, experience and salary required to Box 4759. [9153

VACANCIES exist for senior, intermediate and junior design draughtsmen for work on new aircraft. Permanent positions for suitable applicants. Facilities for cheap flying with firm's flying club. Assistance given with housing accommodation.—Applications in writing, stating age, experience and salary required, to Chief Designer, Auster Aircraft, Ltd., Rearsby, Leics. [9137

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero-engines.—Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0932

DESIGNER draughtsmen are required by a well-known engineering company engaged in gas turbine development work. There are senior and junior vacancies. The work entails design of compressor and turbine units and test rigs.—Applicants should write, in confidence, giving full details, referring to present employment, age, and previous experience, quoting reference AGJ to Box 4900. [9176

DEVELOPMENT engineers, designers, draughtsmen and modification draughtsmen, technicians, technical writers, technical illustrators, technical assistants, spares compiler and stressmen required for aircraft pressurizing, high altitude breathing, etc.—Fully detailed applications with salary required to Personnel Officer, Normalair, Ltd., Yeovil, Somerset. Local interviews arranged where convenient. [9113

AERONAUTICAL service engineer required in Johannesburg, South Africa, for installation, flight testing and servicing of instruments. Practical and theoretical knowledge of A.C. and D.C. amplifier systems and electronic engineering practice essential. Experience of electro-mechanical, servo and synchronous transmission systems, together with H.N.C. or equivalent preferable. Second-class passage paid to successful applicant.

APPLY with full details of experience, etc., to Personnel Manager, Sperry Gyroscope Co., Ltd., Great West Road, Brentford, Middx. [9190

AIR FORCE. Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen, for work on this interesting programme. Good welfare facilities, including staff pension scheme.—Write, giving details of experience and salary required, to Personnel Manager. [0595

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SITUATIONS VACANT

ROLLS-ROYCE, Ltd., Glasgow, require junior and senior technical assistants for technical investigation, production development and repair engineering work on gas turbine engines. Positions hold opportunities for overseas appointments with the company. Minimum technical qualifications Higher National Certificate. Reply, stating age, qualifications, experience and salary required, to The Personnel Manager, Rolls-Royce, Ltd., Hillington, Glasgow, S.W.2, marking applications TE/3. [9002

ENGLISH ELECTRIC Co., Ltd., Luton, have a vacancy for a structural test rig designer for detail work on test rigs. Applicants must have had several years' drawing office experience, preferably on similar work and have served an apprenticeship. Opportunities will be afforded to the successful applicant to take part in practical experimental work.—Write, giving full details, mentioning reference 1042B, to The English Electric Co., Ltd., 336-337 Strand, London, W.C.2. [9169

AERODYNAMICIST required by The English Electric Co., Ltd., Luton, for work on supersonics with particular application to the study of oscillating aerofoil theory. Candidates must have a good degree, aptitude for mathematics and experience in theoretical aerodynamics. Post-graduate qualifications an advantage. Salary according to experience and qualifications.—Write, giving full details, mentioning reference 457D, to The English Electric Co., Ltd., 336-337 Strand, London, W.C.2. [9168

THE ENGLISH ELECTRIC Co., Ltd., Luton, have a vacancy for an assistant for trials and laboratory work. Duties will include liaison work on guided weapons propulsion unit, trials and also experimental laboratory work. Previous experience in mechanical or hydraulic testing would be useful. Applicants should have a minimum technical qualification of Inter B.Sc. or Ordinary National Certificate.—Please reply, quoting Ref. 457E, to Central Personnel Services, English Electric Co., Ltd., 338/7, Strand, London, W.C.2. [9192

LICENSED aircraft engineer required for service in Anglo-Egyptian Sudan. Must possess "A" and "C" licences with endorsement for Auster aircraft (essential). Salary £E900 per annum (no income tax payable), plus free accommodation. Free meals during campaigning season. Free passage (including annual leave passage to U.K.) each way. Two years' contract after satisfactory completion of probationary period.—Write (quoting ad. 768), stating age, fullest particulars of experience, licences and previous overseas employment, to Personnel Manager, Pest Control, Ltd., Bourn, Cambridge. [9152

THE ENGLISH ELECTRIC Co., Ltd., Luton, have a vacancy for a senior aerodynamics engineer for guided missile work involving both technical and administrative responsibility. Candidates must have a good degree or equivalent and be interested in pre-project, performance and assessment aspects. Previous experience of supersonics, stability and performance an advantage. Salary according to experience and qualifications.—Please write, giving full details, mentioning reference 1078, to The English Electric Co., Ltd., 336-337 Strand, London, W.C.2. [9167

BRITISH EUROPEAN AIRWAYS require an assistant foreman (workshop) at Renfrew. Qualifications required: engineering apprenticeship, at least five years' aircraft experience, knowledge of incentive bonus scheme, experience in detail fitting, sheet metal welding, aerofoil and sub-assembly work, preferably in production factory. Salary £715-£815 p.a. The successful applicant will be required to pass a medical examination and participate in pension scheme. Applications, giving full details of age, experience and qualifications to Personnel Officer, Renfrew Maintenance Base, B.E.A. Airport for Glasgow, Renfrew Scotland. [9198

MANCHESTER CORPORATION Airports Department. Applications are invited from suitably qualified persons for the post of airport foreman, Ringway Airport, at a salary in accordance with Miscellaneous Grade IV (£420/£495) of the National Scheme of Service Conditions. Duties will include supervision of portering, aircraft marshalling, freight loading, etc.—Further details, together with application form, are obtainable from the Acting Airports Manager, Ringway Airport, Manchester, on receipt of a stamped addressed envelope. The form should be returned to the same address by February 14th, 1953. Previous applicants need not apply. Canvassing is prohibited. [9183

SENIOR scientific officers, scientific officers, patent examiner and patent officer classes. The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by competitive interview during 1953. Interviews will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1953, may eventually be announced. The scientific posts are in various Government departments and cover a wide range of scientific research and development in most of the major fields of fundamental and applied science; in biology the number of vacancies is small. The patent posts are in the Patent Office (Board of Trade), Admiralty and Ministry of Supply.

CANDIDATES must have obtained a university degree with first or second-class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification; or for scientific posts, possess high professional attainments. Candidates for senior scientific officer posts must in addition have had at least three years' post-graduate or other approved experience. Candidates for scientific officer and patent posts taking their degrees in 1953 may be admitted to compete before the result of their degree examination is known.

AGE limits: senior scientific officers, between 26 and 31; for scientific officers and patent classes, between 21 and 28 during 1953 (up to 31 for permanent members of the experimental officer class competing as scientific officers). London salary scales: senior scientific officers (men) £912-£1,022, (women) £681-£917; scientific officers (men) £440-£707, (women) £440-£578; patent examiner and patent officer classes (men) £440-£655, (women) £440-£578. Somewhat lower rates in the provinces.

FURTHER particulars from the Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting No. S 53/53 for senior scientific officers and S 52/53 and S 120/53 for the other posts. [9184

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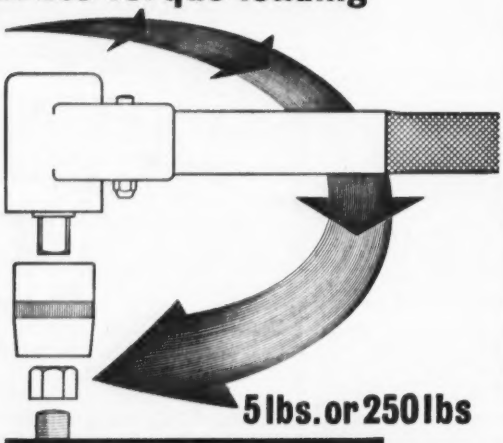

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INDEX TO ADVERTISERS

	Page
Acratork Engineering Co., Ltd.	30
Aerocontacts, Ltd.	26
Alvis, Ltd.	17
Armstrong Whitworth Aircraft, Ltd., Sir W. G.	19
Aston and Co., Ltd., E. S.	28
Aviation Servicing, Ltd.	27
Boulton Paul Aircraft, Ltd.	1
Bristol Aeroplane Co., Ltd., The	Cover iv
British Air Line Pilots' Association, The	29
British Institute of Engineering Technology	28
British Overseas Airways Corporation	20, 21
Canadair, Ltd.	22
Central Office of Information (R.A.F.)	2
Components and Spares (Aircraft), Ltd.	25
Cross Manufacturing (1938), Ltd.	28
De Havilland Aeronautical Technical School, The	28
De Havilland Aircraft Co., Ltd., The	4, 16
De Havilland Propellers, Ltd.	24
Desoutter Bros., Ltd.	23
Detuners, Ltd.	10
Dexion, Ltd.	4
Dowty Equipment, Ltd.	28
Dunlop Rubber Co., (Aviation Division), Ltd.	5
E.M.I. Institutes	30
Fairey Aviation Co., Ltd., The	8
Field Aircraft Services, Ltd.	27
Fishers	29
Flight Refuelling Ltd.	30
Gloster Aircraft Co., Ltd.	Cover i
Handley Page (Reading), Ltd.	28
High Duty Alloys, Ltd.	Cover iii
Lewis, Ltd., D.	25
Martin-Baker Aircraft, Ltd.	18
Modern Furnaces and Stoves, Ltd.	4
Moulded Components (Jablo), Ltd.	29
Napier and Son, Ltd., D.	9
Northern Aluminium Co., Ltd.	Cover ii
Redifon, Ltd.	15
Rollason, Ltd., W. A.	25
Rolls-Royce, Ltd.	13, 30
Rotax, Ltd.	11
Staravia	29
Shell-Mex and B.P., Ltd.	14
Short Bros. and Harland, Ltd.	7
Smiths Aircraft Instruments, Ltd.	25
Teddington Controls, Ltd.	6
Thermionic Products, Ltd.	6
Vickers-Armstrongs, Ltd.	12
Westland Aircraft, Ltd.	

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